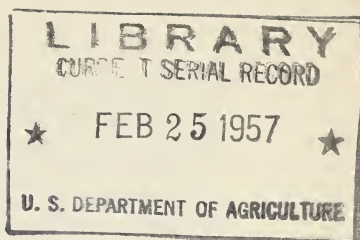


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**COTTON, RAYON,**

**SYNTHETIC FIBERS --**

**COMPETITION IN WESTERN EUROPE**

*By*

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Foreign Agricultural Service

# FOREWORD

United States cotton in its quest for foreign markets must compete not only with cotton produced in other lands but with foreign-produced rayon and other synthetic fibers as well. For a number of years, cotton has been at a comparative price disadvantage in meeting the competition of foreign-produced rayon staple fiber. Throughout most of 1955, United States cotton also failed to meet the competitive prices of foreign-produced cotton. As part of the Foreign Agricultural Service's research program in foreign competition, the Cotton Division is endeavoring to investigate and analyze both of these areas of competition.

This is the first report issued on the nature and scope of the competition between cotton, rayon, and the other synthetic fibers in the principal textile-producing countries in Western Europe. It summarizes some of the more significant findings of a firsthand evaluation that was made by the Cotton Division in the summer of 1956. The report presents general background on the importance and growth of the rayon and other synthetic-fiber industries in Western Europe, changing patterns in consumption of the three major textile fibers (rayon, cotton, and wool), the influence of government policies on the competitive relationships among the fibers, foreign trade in rayon staple fiber, domestic and export pricing policies of the rayon industry, changing price relationships between rayon staple fiber and cotton, and developments in fiber blending. Future reports will be issued on other important aspects of the competitive relationships among the fibers and for other important textile markets of the world.

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January 1957

# PREFACE

Competition among the world's textile fibers is a complicated and elusive thing. It ranges from direct competition among the fibers, where considerations of price and quality must be weighed, to the complementary relationships among the fibers, where it is fabric characteristics or suitability for the purpose that are the prime considerations. Competition occurs not only between natural and synthetic fibers, but throughout the entire range of fibers whatever their origin might be.

As new fibers are developed and introduced, the complications of both the competitive and complementary relationships in inter-fiber competition are intensified. All the factors--price, quality, and suitability for purpose--must be considered in determining how, where, and in what volume the individual fibers are utilized.

In this report, it was necessary to make an arbitrary decision on the terminology used in referring to the fibers that are the products of the chemical laboratory. The term "rayon" is used to refer to the cellulosic fibers--rayon and acetate, both staple fiber and filament--unless more specific identification is necessary, in which case the usual trade terms are used. The term "other synthetic fibers" is used to refer to the entire range of noncellulosic fibers, including the protein fibers. Where it appears desirable for clarity to identify a particular noncellulosic fiber specifically, such as Dacron, nylon, or Orlon, the United States trade name is used. The broad terminology used in this report is not greatly different from that used in most European countries and the rest of the world, where the cellulosic fibers, rayon and acetate, are called artificial fibers and the noncellulosic fibers are called synthetics or the "newer or true" synthetic fibers.

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# COTTON, RAYON, SYNTHETIC FIBERS--

## Competition in Western Europe

### SUMMARY

#### Growth of rayon and other synthetic fiber industries.--

The world's production of rayon and other synthetic fibers continues to grow by leaps and bounds. In 1955, it was the equivalent of 13.1 million bales of cotton—32 percent above the 1950-54 average of 9.9 million bales and approximately four times the production in 1934-38.

Before World War II, the development of the industry in Germany, Italy, and Japan put these countries far out in front of the United States and the rest of the world. It is not surprising, therefore, that the early postwar growth of the industry in the United States and the rest of the world was relatively greater than in these three countries. During the last 2 or 3 years, however, accelerated expansion has occurred in Japan, the Iron Curtain countries, and the minor producing countries. Projected growth of the industry over the next year and a half is also greatest in these areas. Japan's capacity by the end of 1957 is expected to exceed 1951 capacity by 195 percent. Capacity in the Iron Curtain countries by the end of 1957 is expected to reach 113 percent above the 1951 level, while the minor producing countries are expected to develop capacity 151 percent above the 1951 level.

Growth of the total industry from 1951 to the end of 1957 is projected at 49 percent for Western Europe and 46 percent for the United States. The growth for the world as a whole over this 6-year period is projected at 71 percent.

The chemical fiber industry is comprised of individual firms manufacturing a particular fiber or several different fibers of varying characteristics and from numerous source materials. The major groupings of chemical fibers from the standpoint of use characteristics and origin are (1) rayon and acetate staple fibers (cellulosic origin), (2) rayon and acetate filament yarns (cellulosic origin), and (3) noncellulosic fibers (nylon, Dacron, Orlon, etc.).

Growth of the chemical fiber industry, however, is concentrated in the categories of rayon and acetate staple fibers and the noncellulosic fibers, both staple and filament.

Quantitatively, the growth of the rayon and acetate staple fiber (cellulosic) segment of the industry on a world basis since 1951 is nearly three times that of the noncellulosic segment. This is very important to future levels of cotton consumption because rayon and acetate staple fibers are more directly competitive with cotton and are usually spun on the cotton spinning system. Growth in this segment of the industry from 1951 to the end of 1957 is projected at 89 percent. Past growth, the huge capacity now available, and planned expansion of plants to produce rayon staple fiber indicate that this fiber will continue to compete strongly with cotton in the basic textile markets regardless of comparative prices, and that greater competition can be expected also among the world's rayon producers. This increased competitiveness can be expected to assure the increased passing on of production economies in the form of lower prices—particularly in the export market.

The second major group of chemical fibers, rayon and acetate filament yarn, has not grown commensurately with the other two major groups. From 1951 to the end of 1957 total world capacity in this category is expected to increase only 31 percent. Expansion in Western Europe will be about 32 percent, while in the United States, contraction from 1955 capacity will result in capacity about equal to the 1951 level. The rate of expansion from 1951 through the end of 1957 will be highest in the Iron Curtain countries, Japan, and the minor producing countries. The added volume of capacity, however, will be relatively small. Recently, the manufacture of rayon and acetate filament yarn has not been as profitable as that of rayon and acetate staple and the non-cellulosic fibers, even though it was filament yarn that overwhelmed cotton in the tire cord market. Generally, these yarns have fared poorly in apparel. They have done only a little better in household uses. Their greatest market has been in the industrial field. Looking to the future, the producers of the cellulosic filament yarns are making their greatest bid for expansion of outlets in industry, where they have already had phenomenal success; but they can expect growing competition from the noncellulosic fibers in this field.

The greatest percentage expansion has occurred in the noncellulosic group, where expected world capacity by the end of 1957 will be 255 percent above the 1951 level. On a volume basis, however, 1957 production capacity of these new synthetics will amount to only 993.1 million pounds per



year as compared to 3,937.7 million pounds per year for the rayon and acetate staple fiber segment. Whereas rayon and acetate staple fibers are directly competitive with cotton in the basic end uses and have enjoyed a price advantage over cotton for a number of years, the noncellulosic fibers are neither directly competitive in most end uses nor anywhere near competitive in price. Noncellulosic fibers may compete indirectly with cotton and rayon staple as their uses are extended, but so far these fibers have moved into various end uses solely on the basis of special characteristics and promotion and not because of competitive prices. Prices of the noncellulosic fibers have ranged from three to five times the price of cotton or rayon staple over the past few years, but are now trending downward.

Trends in textile fiber consumption patterns.—The relationships of textile fiber consumption patterns among rayon, cotton, and wool in Western Europe have changed remarkably from prewar. Rayon has become much more important in England, the Netherlands, Belgium, Spain, and France. Much of the gain in England and the Netherlands has been at the expense of cotton. Per capita consumption of rayon in West Germany and Italy has not fully recovered to prewar per capita consumption levels. On the other hand, cotton has experienced a great recovery in the former Axis countries—increasing from the unusually low prewar levels by 48 percent in West Germany and by 66 percent in Italy.

Strong consumer resistance to fabrics made of rayon and fabrics blended of rayon and other fibers is evident in practically all countries of Western Europe. This resistance is largely the result of consumers' wartime experience when rayon was the only fiber available and when it was used for many purposes for which it was not suited. The indiscriminate or concealed blending practiced by a few textile producers has resulted in blended fabrics' being called pure fabrics and sold at pure fabric prices. This has not helped reduce consumer resistance. It has, however, made consumers more fiber-quality conscious.

The degree of consumer resistance to pure rayon and rayon blends varies from country to country. It is particularly great in Italy; in fact, the Italian industry, which has currently been operating at only two-thirds of capacity, must depend on export outlets for two-thirds or more of its domestic output. In West Germany, much progress has been made by industry-sponsored promotional campaigns in overcoming consumer resistance. As a result rayon has gained consumer acceptance on its own merits for many end uses.

The greatest progress in market development has been made in England, where a well-organized and well-directed use-development program backed up by industry promotion has put rayon in a strong position with consumers. In addition, rayon has continuously held a greater price advantage over cotton in England than on the continent, with the exception of Spain. Rayon has made important per capita consumption gains also in the Netherlands, Belgium, and France. These gains are for the most part in line with the Western European average.

Effect of government policies on the competitive position of cotton, rayon, and other synthetics.--There is no positive proof that the major textile producing countries of Western Europe have provided direct material assistance or granted special incentives to the producers of rayon or any of the other synthetic fibers over the past 5 or 6 years. Rayon staple fiber producers as well as some government officials frankly state that no special governmental assistance has been needed in recent years. It is usually pointed out that since the early postwar recovery period, the industry has operated on a profitable basis. It has expanded output to meet increased demands; and most important of all, the prices of cotton, wool, and silk have been sufficiently high that no special government assistance for the synthetic fibers has been needed.

There is reason to believe, however, that the synthetic-fiber industries in many countries have benefited indirectly as the result of governmental policies regulating the allocation of dollars for the procurement of raw materials and the issuance of import permits.

Spain and Portugal are special cases. In Spain, the economy is tightly regulated, and for the past several years pricing policies for cotton and rayon have been such as to make rayon staple fiber available to spinners at a price 17 to 23 cents a pound lower than that for raw cotton. It might be added that the price of rayon staple to spinners in Spain is the highest in Western Europe. In Portugal, the government has actually encouraged the construction of facilities for rayon production by offering tax concessions and special depreciation allowances while maintaining strict control over cotton imports.

Trade restrictions on textile fiber imports in Western Europe.--All of the major countries producing rayon and other synthetic fibers impose duties on the imports of such fibers in order to protect domestic producers, but Italy is the only Western European country that imposes a significant duty on the importation of raw cotton. Protective duties ranging from 4 to 10.5 cents a pound on the importation

of rayon discourage intra-Western European trade and are largely responsible for the fairly wide variation in prices of rayon from one country to another. The actual duties on the other synthetic fibers are even higher than those on rayon.

The tariff structure for rayon and other synthetic fibers also encourages selective pricing. In most countries with relatively high ad valorem duties, domestic prices are higher than export prices. It can be concluded that a much higher degree of competition exists among rayon and the other synthetic fibers in the foreign markets than in home markets.

Exports of rayon staple fibers to the United States and export pricing policies.—Imports of rayon staple fiber by the United States rose to an all time high level in 1955. This fact caused considerable anxiety, both to the domestic producers of rayon staple fiber and to the United States raw cotton industry. A sharp drop in the volume of imports early in 1956 from the previous year indicates that this was probably a temporary market situation.

Western European countries have been the principal exporters to the United States. The strong import demand for rayon in the United States in 1955 permitted the Western European industry to operate close to capacity levels and contributed to a very profitable year. Foreign producers recognized, however, that this demand was temporary, especially in view of the fact that the capacity of the rayon staple fiber industry in the United States by the end of 1957 was expected to be 25 percent above the 1955 level.

The calculated value of United States imports of rayon staple fiber in 1955 was 27 cents a pound, which was slightly below the previous year's calculated value of 28 cents. (For an explanation of the calculated unit prices, see footnote 8 on page 32.) Lower export prices of foreign producers were partly responsible for increased purchases by the United States; however, it should be recognized that in order to sell in the United States market foreign producers had to quote prices to which import duties could be added without exceeding the United States market price for domestically produced rayon staple fiber.

Without adequate cost data one can only speculate whether the low rayon staple export prices of 1955 indicate that domestic sales prices in foreign producing countries could also be lowered without seriously reducing company profits. Very likely, companies producing rayon staple in 1955 were able to maintain profits by achieving a high volume of production and thus reducing unit costs. Part of the output was probably sold abroad at prices that were lower than total



costs and maybe no more than equal to or slightly in excess of cash costs, while the part that was sold in the protected home markets brought prices high enough to cover cash costs, overhead costs, and an allowance for profits. Such manipulation in many cases might actually result in a more favorable profit position for the entire business operation. Since selective pricing can be just as effectively employed between domestic and foreign purchasers as between customers within the domestic market, a foreign producer usually finds it advantageous to reduce export prices sufficiently to sell the total output. If this is the case, it is doubtful whether the companies could afford to reduce prices in the domestic market to the same extent as in the export market.

Comparison of rayon staple fiber and raw cotton prices.-- The price of rayon staple fiber--the fiber most competitive with cotton on a price basis in the bulk of the textile end-use markets--varies widely from one country to another. Throughout 1955 domestic rayon staple fiber price quotations in most Western European countries were from 1 cent to 6 cents below those in the United States.

Rayon staple fiber prices in Western European countries vary for numerous reasons, the most important being (1) differences in cost structures, pricing policies, and foreign exchange positions of the countries concerned; (2) differences in production efficiency arising from plant layout, type and age of plant equipment, labor-management policies, and governmental policies relating to employment and social benefits; and (3) differences in tariffs imposed upon rayon staple imports.

Throughout most of 1955 and early 1956, most foreign-grown cottons were available to Western European spinners at prices as much as 9 cents a pound below those of United States cotton and therefore had a much stronger price advantage over rayon staple fiber than did United States cotton.

After August 1, 1956, this situation changed, since all qualities of United States cotton were sold at prices competitive with foreign growths. All United States cotton moved into a strong competitive price position in all of the major textile producing countries except Spain. In fact, unless 1957 sales prices for rayon staple fiber are reduced from those of the last several years, U.S. Middling 1-1/32-inch cotton, on the basis of October 1956 quotations for future delivery, has a price advantage over rayon staple of 1.7 cents a pound in West Germany and 0.6 cent a pound in France. On the basis of recent quotations, however, rayon staple still has a price advantage of 3.2 cents per pound in Italy and 2.2 cents a pound in England. In Spain, of course,

where raw fiber prices are set by the government, rayon staple fiber has a price advantage of about 17.6 cents a pound.

The competitive cotton export pricing policy initiated by the United States in 1956 can be expected to have a significant effect on the price relationships between rayon and cotton far into the future. However, it is too early to know how foreign rayon producers will react to lower raw cotton prices. Not enough information is available on costs of producing rayon staple fiber to predict how much rayon staple producers could reduce selling prices without running into the red. Neither is there a factual basis for determining how much the consumption of cotton can be expected to gain at the expense of rayon staple fiber if current price relationships hold. The judgment of some informed textile people is that cotton consumption will increase. Many, however, think that the actual gain cotton might make against rayon would be relatively small in the short run. If this is true, rayon producers might not stand to profit much by cutting prices to maintain a price advantage over cotton. In fact, they might profit more by maintaining prices even though they might need to make temporary reductions in production schedules.

Increased competition between cotton and rayon in the principal rayon-producing countries will almost surely result in intensified competition among the world's rayon producers in the export market--a market which, they all admit, is already highly competitive.

Developments in fiber blending.--Some of the more important factors that have encouraged the practice of fiber blending since World War II are these: (1) The shortage of foreign exchange available in many foreign countries for the purchase of raw cotton; (2) the nationalistic considerations giving impetus to the development of domestic industries, for greater self-sufficiency and increased domestic employment opportunities; and (3) the price disparity between raw cotton and rayon staple fiber, which has encouraged the substitution of the cheaper priced rayon staple for cotton.

As a factor encouraging the substitution of rayon for cotton, the shortage of foreign exchange to purchase raw cotton is not nearly so important as it was several years ago. In fact, since most Western European currencies have hardened, it is no longer a major deterrent to cotton procurement. Only in France, Italy, and Spain, where free dollars for the purchase of United States cotton are still difficult to obtain, is it still a major problem. It should also be remembered that most countries import a

substantial amount of the raw materials needed for the production of chemical fibers.

Some countries consider rayon staple fiber as their "national" fiber and make the argument that its use should be encouraged over that of cotton because its production provides domestic employment. Actually, however, labor represents a relatively small percentage of the total cost of production in the chemical fiber industry, as compared to the cotton textile industry.

Many cotton textile people believe that the crucial point of price competition is at the mill door. To the extent that it is the yarn spinner that makes the decision as to which fiber will be used, the relative prices of cotton and rayon staple fiber may be highly significant in determining which of the fibers are to be spun and the extent to which they may be blended.

Unquestionably, when rayon prices were 15 to 40 percent below the prices of cotton, the blending of the fibers resulted in lower fabric costs. The actual reduction in fabric cost is far less than most people realize, however. Calculations showing the effect of a reduction in cotton prices from 40 to 30 cents a pound with rayon prices remaining the same at 30 cents a pound show that the cost of a finished fabric weighing 4 ounces per yard would be reduced only about 2-1/2 cents per yard in the conventional blend of one-third rayon and two-thirds cotton. In an 8-ounce fabric with the same percentage blend, the raw fiber cost per yard of the finished fabric would be reduced 3-1/3 cents a yard with the same 10-cent reduction in the price of cotton. If such fabrics sold originally for a dollar a yard, this would represent a cost reduction to consumers of only 2-1/2 to 3-1/3 percent.

Lower raw material costs must be passed on through all the stages of processing if they are to help increase consumption. There is reason to believe that in textile industries such as those in Western Europe, where a high degree of specialization exists and where minimum selling prices are established by agreement among association members, it takes a long time for lower raw material costs to be reflected in lower prices at the consumer level. This time lag is of significance to the producers of rayon staple fiber as well as cotton. The raw material producers as a group cannot hope to benefit from lower prices for their products unless such prices eventually contribute to increased consumption of the finished product.

Despite strong consumer resistance to blended fabrics in Western Europe, considerable progress is being made in gaining consumer acceptance. Development and



promotional work by the rayon producers is beginning to pay off. In some countries, such as England and West Germany, the major effort has been directed toward the development of standard fabrics incorporating new fibers. These fabrics already represent a very substantial share of the total textile market. In others, such as Italy and France, the effort has been directed more toward the development of new fabrics with special style appeal.

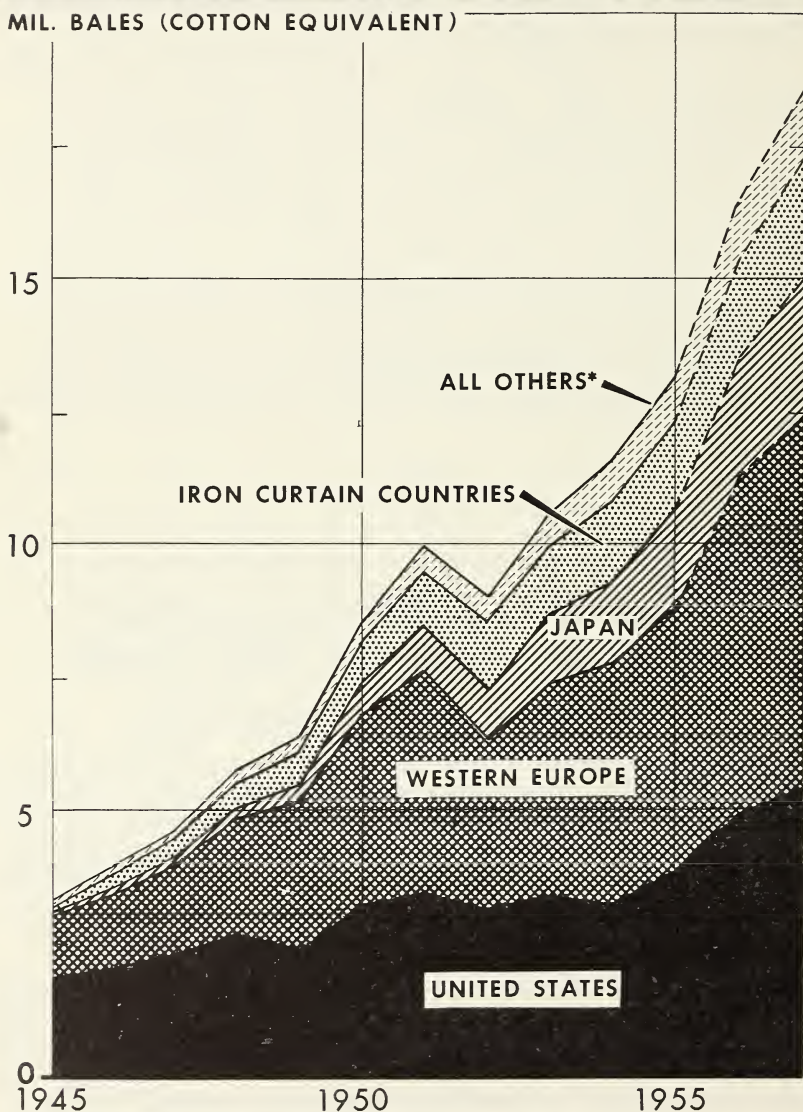
Price has certainly been an important factor encouraging the blending of rayon staple and cotton into fabrics popular in the mass market. However, textile leaders point out other encouraging factors. One is the technical advantage in the processing of blended yarns in the knitting industry. Another is the satisfactory result obtained by using blended yarns in knitted goods where the differences between dry and wet strength of cotton and rayon yarn are not too important. Many textile people feel that although lower cotton prices probably would not turn back the trend toward the use of fiber blends in the knitting industry, they would halt or reverse the trend toward both the honest and the concealed blending of rayon and cotton in many fabrics of the woven type.

## IMPORTANCE AND GROWTH OF THE WORLD'S RAYON AND OTHER SYNTHETIC FIBER INDUSTRIES

Compared with the relatively slow growth of the world's cotton textile industry, the expansion of the world's chemical fiber industry has been phenomenal. World production of rayon and other synthetic fibers, during the period 1934 to 1938 inclusive, averaged the equivalent of 3.3 million bales of cotton; during the postwar period 1950 to 1954 inclusive, there was a 9.9 million bale equivalent produced, and in 1955 this total rose to 13.1 million bales, an increase of about 300 percent in the 22-year period under consideration (see table 1). This trend has been more pronounced in countries of high industrialization than it has been in other areas.

Since the early 1930's, rayon has achieved a place of major importance in the Western European textile industry. Germany and Italy in their effort to become self-sufficient

# WORLD PRODUCTION OF RAYON AND OTHER SYNTHETIC FIBERS, BY PRINCIPAL AREAS, 1945-55, and capacity projections, 1956 and 1957



\* CANADA, CENTRAL AMERICA, SOUTH AMERICA, TURKEY, YUGOSLAVIA, ASIA (EXCEPT JAPAN), AUSTRALIA.  
DATA FOR 1956 AND 1957 ARE ESTIMATED  
SOURCE: COMPUTED FROM DATA PUBLISHED IN TEXTILE ORGANON.

in textiles before World War II led the way in the construction of rayon production facilities. In the early postwar period, significant expansion took place throughout the other Western European countries, with England and France, as well as the Netherlands and Belgium, becoming major producers. Significant expansion is now under way in Spain. Every country is now producing rayon and practically every country is already producing one or more of the newer non-cellulosic synthetics or contemplating such production. Italy is the only country that still has a high proportion of its total rayon production capacity unutilized.

In terms of total volume of rayon and other synthetic fibers, Western European production as a whole is about one-third above United States production. In 1955, Western European production of rayon and other synthetics was the equivalent of 5.0 million bales of cotton.<sup>1</sup> In the same year production of rayon and other synthetics in the United States amounted to the equivalent of 3.8 million bales of cotton, compared to 1.8 million bales in Japan and 2.5 million bales for the rest of the world.

The following tabulation compares the production of rayon and other synthetic fibers with the consumption of raw cotton for selected countries of Western Europe in 1955:

Country	Production of rayon and other synthetic fibers	Consumption of raw cotton	Country	Production of rayon and other synthetic fibers	Consumption of raw cotton
	<u>Million bales<sup>1</sup></u>	<u>Million bales<sup>2</sup></u>		<u>Million bales<sup>1</sup></u>	<u>Million bales<sup>2</sup></u>
United Kingdom .....	1.1	1.5	Belgium .....	.2	.5
West Germany .....	1.2	1.3	Spain .....	.2	.4
Italy .....	.7	.8	Others .....	.8	1.0
France .....	.6	1.2			
Netherlands .....	.2	.3	Total Western Europe.	5.0	7.0

<sup>1</sup>Cotton-bale equivalent of 500 pounds gross weight.

<sup>2</sup>500 pounds gross weight.

It should be noted that production of rayon and other synthetic fibers is concentrated in four countries--the United Kingdom, West Germany, Italy, and France. A direct comparison of this production with total consumption of cotton in an individual country overstates the position of rayon

<sup>1</sup>The conversion rate is as follows: 425 pounds of synthetic fiber = one 500-pound bale of raw cotton (gross weight). Allowance is made for differences in spinning waste.



TABLE 1.--Rayon and other synthetic fibers: World production, by principal areas, averages 1934-38 and 1950-54, annual 1955

Area	Average		1955
	1934-38	1950-54	
	Million bales <sup>1</sup>	Million bales <sup>1</sup>	Million bales <sup>1</sup>
Western Europe.....	1.7	3.8	5.0
Iron Curtain countries .....	.1	1.2	1.7
Japan .....	.9	1.1	1.8
All other areas .....	-	.6	.8
Total, excluding United States .....	2.7	6.7	9.3
United States .....	.6	3.2	3.8
World total .....	3.3	9.9	13.1

<sup>1</sup>Cotton bale equivalent. Conversion rate: 425 pounds of synthetic fiber = one 500-pound bale of cotton, gross weight, after adjustments for spinning waste.

Computed from data published in the *Textile Organon*, Textile Economics Bureau, New York.

and the synthetics relative to cotton in the country's textile raw material market as a whole, because much of the production of rayon and other synthetic fibers in each country is exported as unprocessed fibers. Italy, for example, exports approximately two-thirds. Nevertheless, this comparison is of some significance in that it gives some idea of the quantity of rayon and other synthetic fibers domestically available as compared to the quantity of cotton actually consumed.

With 37.8 percent of the total world production of rayon and other synthetic fibers in Western Europe, 29.4 percent in the United States, and 13.8 percent in Japan, it is evident that these are the regions of the world where the dynamic developments in inter-fiber competition are now taking place. These are also the areas where the greatest strides are being made in the development of new noncellulosic synthetics.

## PRODUCTION CAPACITY TRENDS IN RAYON AND OTHER SYNTHETIC FIBERS

Western Europe, with more than 35 percent of the world's production capacity for rayon and other synthetic fibers, contemplates further expansion—proportionally less, however, than that contemplated by other foreign producing areas.

Production and capacity statistics for 1951, 1955, and 1956, plus the foreign industries' projected capacity estimates for 1957, are summarized in table 2.

The first phase of postwar recovery in the Western European industries was practically completed by the end of 1951. The situation in these industries in 1952 indicated that there might be a period of leveling off. Depressed conditions resulting from the textile recession during the latter part of 1952 gave reason to believe that there might even be excess capacity. This situation changed quickly as production began to rise again in 1953, and the rayon industries in every country except Austria began to make plans for additional capacity. As a result, production capacity by 1955 for Western Europe as a whole had risen 28 percent above the 1951 level. Another increase of 5 percent took place from March 1955 to March 1956. This increase was rather widespread throughout Western Europe; some expansion occurred in every producing country except Norway and Yugoslavia. Capacity by the end of 1957 is expected to rise 16 percent above that of March 1955.

In the United Kingdom a major expansion is under way and is expected to be completed by the end of 1957. Two leading rayon producers recently announced expanded investment programs for the future. The country's leading producer plans a \$196 million investment program over the next 10 years while another important company is proceeding with a capital expenditure of \$11.2 million over the next few years.<sup>2</sup> These announcements, which were made in a year when the trading profits fell significantly, are of tremendous importance. Profits of the largest firm during the last year dropped from \$60.8 million in 1954 to \$56.0 million in 1955.<sup>3</sup> Profits of the other firm dropped from \$11.5 million for 53 weeks in 1954 to \$9.24 million for 52 weeks in 1955. The London Economist pointed out that the drop in profits resulted from a shrinkage of margins rather than a shrinkage in the volume of trade.

Price stability has been the cornerstone of the British rayon producers' policy. British rayon filament yarn prices have been steady since 1951, while staple fiber prices have not changed since they were reduced 3.5 cents a pound in 1953. With competition becoming keener between cotton and rayon in the home market as well as among rayon producers themselves in the export market, the policy of holding prices down becomes even more important.

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<sup>2</sup>Financing Rayon's New Growth. Economist [London] v. 180, No. 5889, p. 53. 1956.

<sup>3</sup>Ibid.

TABLE 2.--Rayon, acetate and other synthetic fibers: World production, by major textile-producing countries, 1951 and 1955; available capacity, 1951, 1955, and 1956; projected capacity, 1957<sup>1</sup>

Area and country	1951			1955			1956		1957		
	Pro- duction	Capacity		Pro- duction	Capacity		Capacity		Capacity		
		Avail- able	Used		Avail- able	Used	Expansion over 1951	Avail- able	Expansion over 1955	Pro- jected	Expansion over 1955
Million pounds	Million pounds	Percent	Million pounds	Million pounds	Percent	Percent	Million pounds	Percent	Million pounds	Percent	
Western Europe:											
Austria .....	95.3	99.2	96	90.4	100.0	90	1	2	103.2	3	
Belgium .....	66.6	55.8	119	72.9	74.6	98	34	6	89.6	20	
Finland .....	19.2	19.0	101	37.6	39.0	96	105	10	49.0	26	
France .....	236.0	290.8	81	269.7	322.9	84	11	8	392.3	21	
Germany, West .....	416.3	406.2	102	512.1	536.0	96	32	4	584.0	9	
Greece .....	3.5	8.0	44	3.4	8.4	40	5	24	10.4	24	
Italy .....	292.1	445.3	66	308.3	527.0	59	18	5	552.0	5	
Netherlands .....	81.0	80.5	101	101.5	102.0	100	27	11	125.0	23	
Norway .....	31.4	30.8	102	35.1	37.1	95	20	-	40.1	8	
Portugal .....	2.8	2.2	127	3.3	12.2	27	455	8	16.7	37	
Spain .....	51.8	66.6	78	102.9	110.8	93	66	2	133.3	20	
Sweden .....	37.6	40.0	94	40.0	47.4	84	19	3	50.9	7	
Switzerland .....	41.4	41.4	100	53.4	55.0	97	33	4	58.4	6	
United Kingdom .....	388.0	410.8	94	480.5	579.0	83	41	3	715.0	23	
Yugoslavia .....	-	-	-	-	-	-	-	-	46.7	-	
Total .....	1,763.0	1,996.6	88	2,111.1	2,551.4	83	28	5	2,966.6	16	
Iron Curtain countries .....	420.0	434.2	97	700.0	750.0	93	73	3	925.0	23	
Japan .....	375.7	380.0	99	767.8	758.1	101	100	27	1,119.7	48	
United States .....	1,464.8	1,560.0	94	1,640.0	2,208.0	74	42	-	2,279.0	3	
All other .....	206.9	232.7	89	359.9	440.0	82	89	6	583.9	33	
World total .....	4,230.4	4,603.5	92	5,578.8	6,707.5	83	46	4	7,874.2	17	

<sup>1</sup>Capacity estimates for 1951, 1955, and 1956 on annual basis as of March; capacity projections for 1957 on annual basis as of December.

Computed from data published in issues dated June 1951, June 1954, June 1955, and June 1956 of the Textile Organon, Textile Economics Bureau, New York.



The Economist article also notes that only a small drop has occurred in the price of dissolving wood pulp, while prices of all other basic raw materials have gone up; the price of caustic soda has risen 40 percent from 1951 levels, while average weekly earnings have risen 43 percent.<sup>4</sup> It will be interesting to see how long the British industry succeeds in maintaining its policy of price stability in face of rising costs. It will also be interesting to see if the industry can finance its projected expansion program out of earnings as now contemplated.

Sizable additions to present capacity are also under way in France, Spain, West Germany, and the Netherlands. These expansions were planned a year or more ago. It is highly probable that the decision of management in the respective countries to move ahead does not reflect the keener price competition now prevailing between cotton and rayon staple fiber, or for that matter, that among rayon staple producers in export markets. It is highly improbable that the rayon staple fiber producers' decisions to expand their facilities further at this time adequately reflect the rapid accumulation of world raw cotton stocks since 1952.

Expansion of production capacity for rayon and the other synthetics outside of Western Europe from 1951 to 1955 proceeded much faster percentage-wise than in Western Europe. During this period, production capacity increased 73 percent in the Iron Curtain countries, 100 percent in Japan, 42 percent in the United States, and 89 percent in the rest of the world (see table 2).

Also in projected expansion of capacity by the end of 1957, the foreign producing areas outside of Western Europe are expected to lead the way again; additions to 1955 capacity will be 48 percent in Japan, 23 percent in the Iron Curtain countries, and 33 percent in all other foreign countries. The overall expansion projected for all synthetics in the United States by the end of 1957 is only 3 percent above the 1955 level. To ascertain how this expansion may affect consumption of cotton, the types of fibers to be produced by the increased facilities must be examined.

Production and capacity statistics for the chemical fiber industry are usually broken down into three major categories, as follows: (1) rayon and acetate staple fiber, (2) rayon and acetate filament yarns, and (3) noncellulosic staple fibers and filament yarns. Rayon and acetate staple fibers are usually spun into yarn on the cotton spinning system. Some are spun into pure yarns; some are blended

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<sup>4</sup> Ibid., p. 54.

with the natural fibers such as cotton, wool, or flax, or with the noncellulosic staple fibers, to make mixed yarns of varying characteristics. Filament yarns, on the other hand, are the uncut products of the spinnerette and can be used directly in the weaving room without further processing. The noncellulosic fibers--nylon, Dacron, Orlon, and the like--are all produced both as staple and as continuous filaments.

In showing the impact of the competitive and complementary relationships among these textile fibers, a review of production and capacity trends for each category is much more significant than the overall totals. Trends in production, by the three major groupings, are summarized in table 3.

Rayon staple has traditionally offered the strongest competition to cotton in the basic end uses. For a number of years, the price of rayon staple has favored its use over cotton. In Western Europe, the rayon staple category is the one where the major expansion volumewise has taken place already and is expected to take place through 1957. Projected capacity by the end of 1957 is 41 percent above the 1951 level and 17 percent above 1955 capacity. The growth of this segment of the synthetic fiber industry is even more pronounced in the other areas of the world than in Western Europe. In fact, expansions planned in the rest of the world are concentrated in the rayon staple category. The United States is no exception. Although overall projection capacity of the total United States synthetic fiber industry by the end of 1957 is 46 percent above 1951 capacity, that of the rayon staple fiber segment is some 110 percent above 1951 capacity and 25 percent above 1955 capacity. Rayon staple fiber must, therefore, be viewed as a continuing threat to cotton all over the world.

Rayon and acetate filament yarns are not directly substitutable for cotton in many basic apparel uses. However, high tenacity rayon yarn has displaced cotton almost entirely in the tire cord market, and both regular and high tenacity filament yarns are strongly competitive with cotton in other industrial and household uses. Prices of the filament yarns have been higher than the price of raw cotton on a per pound basis. The filament yarns, however, are ready for the weaving room as soon as they are produced, and the spinning operation is therefore eliminated.

In the past few years there have occasionally been significant cutbacks in production facilities for these yarns. Some of these cutbacks have been related to modernization. Recently the trend has been toward the continuous process, which is much more efficient than the old "box" or "bobbin"

TABLE 3.--Rayon and other synthetic fibers: Available production capacity, by areas and types, 1951, 1955, and 1956; projected capacity, 1957

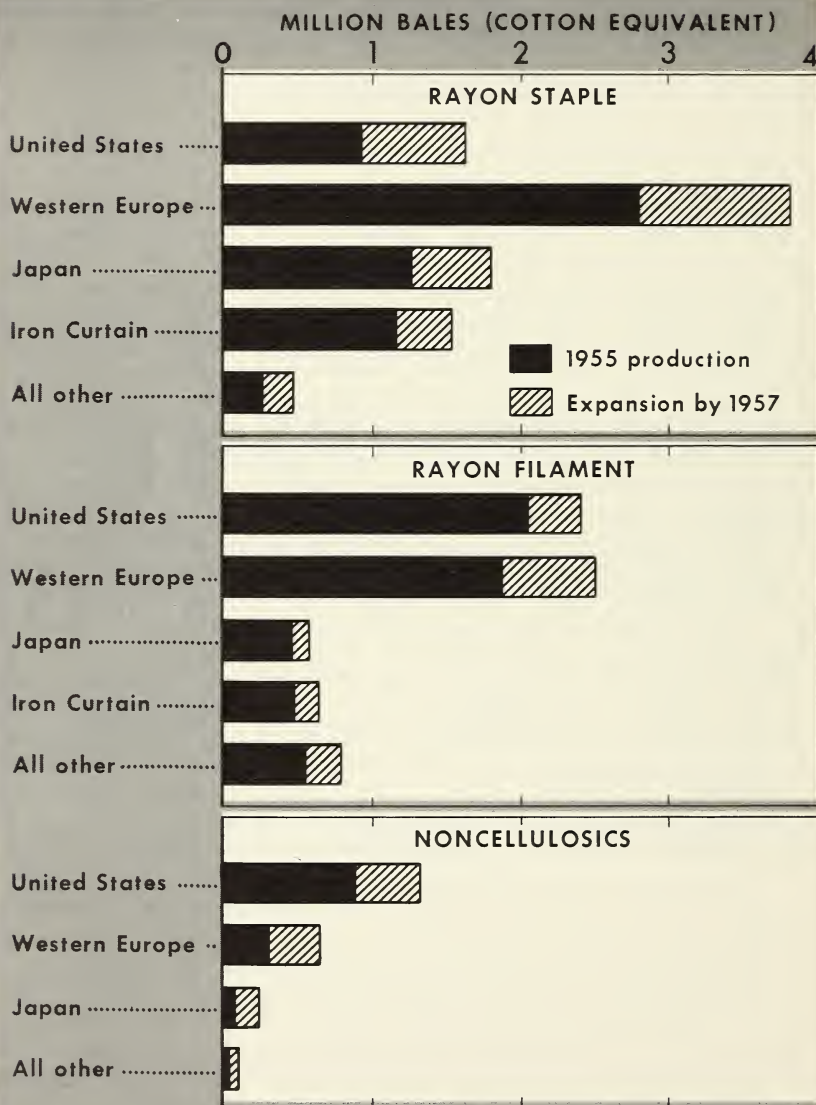
Country and year	Rayon staple		Filament yarn		Noncellulosic <sup>1</sup>		Total	
	Capacity	Increase over 1951	Capacity	Increase over 1951	Capacity	Increase over 1951	Capacity	Increase over 1951
Western Europe:	<u>Million pounds</u>	<u>Percent</u>	<u>Million pounds</u>	<u>Percent</u>	<u>Million pounds</u>	<u>Percent</u>	<u>Million pounds</u>	<u>Percent</u>
1951	1,149.9	-	806.7	-	240.0	-	2,196.6	-
1955	1,391.2	21	996.1	23	164.1	310	2,551.4	28
1956	1,431.8	25	1,018.0	26	221.4	454	2,671.2	34
1957	1,621.6	41	1,062.7	32	282.3	606	2,966.6	49
Iron Curtain countries:								
1951	306.6	-	127.6	-	-	-	434.2	-
1955	550.0	79	200.0	57	-	-	750.0	73
1956	550.0	79	225.0	76	-	-	775.0	78
1957	650.0	112	275.0	116	-	-	925.0	113
Japan:								
1951	239.0	-	133.0	-	28.0	-	2380.0	-
1955	518.0	117	201.0	51	39.1	389	758.1	100
1956	660.0	176	229.0	72	73.8	822	962.8	153
1957	770.0	222	248.5	87	101.2	1,165	1,119.7	195
United States:								
1951	330.0	-	1,005.0	-	225.0	-	2,156.0	-
1955	555.0	68	1,127.0	12	526.0	134	2,208.0	42
1956	612.0	85	1,015.0	1	478.0	112	2,105.0	35
1957	694.0	110	1,021.0	2	564.0	151	2,279.0	46
All other areas:								
1951	58.0	-	167.7	-	27.0	-	2232.7	-
1955	129.1	123	282.3	68	28.6	309	440.0	89
1956	147.7	155	285.0	70	32.3	361	465.0	100
1957	202.1	248	336.2	100	45.6	551	583.9	151
World total:								
1951	2,083.5	-	2,240.0	-	280.0	-	24,603.5	-
1955	3,143.3	51	2,806.4	25	757.8	171	6,707.5	46
1956	3,401.5	63	2,772.0	24	805.5	188	6,979.0	52
1957	3,937.7	89	2,943.4	31	993.1	255	7,874.2	71

<sup>1</sup>Staple and filament yarn.

<sup>2</sup>Estimated.

Computed from data published in issues dated June 1951, June 1955, and June 1956 of the Textile Organon, Textile Economics Bureau, New York.

# WORLD PRODUCTION OF RAYON AND OTHER SYNTHETIC FIBERS, by categories, 1955 and planned expansion by 1957



SOURCE: PREPARED FROM DATA PUBLISHED IN THE TEXTILE ORGANON



method of spinning. Therefore, in most cases the discontinued facilities have been supplanted by modern and more efficient facilities.

It is general knowledge that throughout the world the profits of this segment of the industry have lagged behind those of the other two segments. Production costs for rayon filament yarns are higher than those for rayon staple fiber, and the uses of rayon filament are more restricted. Demand in the apparel field for filament-type fabrics has been sluggish. As a result, this segment of the rayon industry has relied heavily on the development of outlets in the industrial field. Although it has achieved considerable success, which may be due to the general industrial expansion throughout the world, the market has been highly competitive. Over-capacity in regular tenacity filament yarn also has contributed to depression in this segment. Any upward trend has been reserved in the main to high tenacity yarns.

Noncellulosic staple fibers and filament yarns have not in general been considered directly competitive with cotton. In many cases up to this time they have been actually complementary, especially when used in blends with cotton yarns to achieve special fabric effects or characteristics. Their prices have been several times greater than those of raw cotton.

This segment of the total synthetic fiber industry has shown strength everywhere in the last 5 or 6 years. Percentage increases have been extremely high, for these fibers are of recent origin. The United States has led the way in this development; Western Europe is moving along cautiously but rapidly, as is Japan. The Iron Curtain countries and others that are minor producers of rayon and synthetics have not entered into the production of the non-cellulosics to any significant degree.

Expansion of the noncellulosic fibers is not much of a direct competitive threat to cotton at this stage, given the existing price relationship among all the synthetic fibers. Besides being more or less complementary to cotton in many blended fabrics, the noncellulosics--both staple fiber and filament yarn--are used for purposes or in specialized fabrics that in a sense constitute new uses. The competitive threat to cotton by these fibers up to this time has been to a large degree indirect, in contrast to the direct competition posed by (1) rayon and acetate staple in the basic textile end-use market, and (2) regular and high tenacity rayon filament in industrial and household uses. There is a fringe area, however, where noncellulosics--regardless of their high costs--are being and will continue to be used

for purposes that make them to some degree competitive with cotton as well as all other textile fibers.

## TEXTILE FIBER CONSUMPTION PATTERNS AND TRENDS IN WESTERN EUROPE

Per capita fiber consumption estimates are essential in determining the relative importance of the various fibers in any country or any particular region of the world. Without doubt, the best source of information on this subject is the computation made by the Food and Agriculture Organization of the United Nations on the per capita availability for home use of the three major textile fibers--cotton, wool, and rayon. Per capita availabilities are a fairly accurate indication of actual per capita consumption. FAO officials state, however, that the fiber equivalent of the final consumption of fiber products country by country and year by year can be at best only a series of approximations. FAO made its fiber computations by taking the industrial consumption of each raw fiber for a country and adding or subtracting its trade balance to arrive at the available supply for domestic use. These FAO statistics are used in this report to describe fiber consumption patterns in individual countries even though sufficient data are not available to correct for annual inventory changes.

### Recent Patterns in Textile Fiber Consumption

In 1954 the per capita consumption of the products made from the three major textile fibers in Western Europe was just over half of the consumption level in the United States--17.2 pounds per capita as compared with 33.3 pounds (see table 4). Western Europe's per capita consumption of cotton products was also less than half of United States consumption, and its per capita consumption of rayon products, less than two-thirds. On the other hand, per capita consumption of wool products in Western Europe was higher than that in the United States.

Fiber consumption varies substantially from one country to another. In Western Europe, per capita consumption of rayon and other synthetic fibers is highest in the United Kingdom and West Germany, where the poundage is approximately the same as in the United States. Increased rayon consumption in the United States in 1955, however, may very



TABLE 4.--Cotton, wool, and rayon:<sup>1</sup> Per capita fiber availability for home use, selected Western European countries and the United States, 1938 and 1954

Country and commodity	1938		1954	
	Quantity per capita	Share of total availability	Quantity per capita	Share of total availability
United Kingdom:	<u>Pounds</u>	<u>Percent</u>	<u>Pounds</u>	<u>Percent</u>
Cotton .....	17.0	65	14.1	53
Wool .....	7.1	27	5.7	22
Rayon .....	2.2	8	6.6	25
Total .....	26.3	100	26.4	100
Germany, West:				
Cotton .....	<sup>2</sup> 7.3	42	10.8	52
Wool .....	<sup>2</sup> 2.9	17	3.7	18
Rayon .....	<sup>2</sup> 7.1	41	6.4	30
Total .....	<sup>2</sup> 17.3	100	20.9	100
Italy:				
Cotton .....	4.4	54	7.3	61
Wool .....	.4	5	1.5	13
Rayon .....	3.3	41	3.1	26
Total .....	8.1	100	11.9	100
France:				
Cotton .....	10.4	66	11.7	62
Wool .....	4.2	27	4.0	21
Rayon .....	1.1	7	3.3	17
Total .....	15.7	100	19.0	100
Belgium-Luxembourg:				
Cotton .....	11.0	68	8.4	54
Wool .....	4.0	25	2.8	19
Rayon .....	1.1	7	4.2	27
Total .....	16.1	100	15.4	100
Netherlands:				
Cotton .....	12.3	71	12.8	57
Wool .....	3.7	21	4.9	22
Rayon .....	1.3	8	4.6	21
Total .....	17.3	100	22.3	100
Spain:				
Cotton .....	3.1	63	5.1	54
Wool .....	.9	18	1.3	14
Rayon .....	.9	19	3.1	32
Total .....	4.9	100	9.5	100
Average, Western Europe:				
Cotton .....	8.8	59	9.7	56
Wool .....	3.3	22	3.3	19
Rayon .....	2.9	19	4.2	25
Total .....	15.0	100	17.2	100
United States:				
Cotton .....	21.4	82	24.3	73
Wool .....	2.2	9	2.6	8
Rayon .....	2.4	9	6.4	19
Total .....	26.0	100	33.3	100

<sup>1</sup>The term "rayon" includes rayon staple and filament yarn only.

<sup>2</sup>Pre-World War II Germany.

Food and Agriculture Organization of the United Nations, Monthly Bulletin of Agricultural Economics and Statistics, vol. IV, No. 12, December 1955, and Bulletin No. 25, March 1954.

well push United States per capita availability of rayon above the per capita level attained in either West Germany or the United Kingdom. Per capita rayon consumption in the Benelux area approaches the average for Western Europe as a whole, while per capita consumption in Italy, France, and Spain is considerably below the Western European average.

In 1954, cotton comprised from one-half to two-thirds of the total consumption of the three major textile fibers in most Western European countries compared with nearly three-fourths of the total in the United States. It accounted for a higher percentage of the total in France, Italy, and the Netherlands, however, than it did in other Western European countries.

The percentage of rayon in total consumption of the three textile fibers is highest in Spain and West Germany and lowest in France and the Netherlands. In Spain the relative rise in rayon consumption in recent years is attributable to the Spanish Government's policy of cotton buying and price setting. This policy results in a wide differential between the price of raw cotton and rayon staple fiber, the price of cotton being fixed at almost 45 percent above the price of rayon staple fiber.

### Long-Term Trends in Western European Fiber Consumption

Per capita availabilities of the products of the three major textile fibers in Western Europe averaged in 1954 over 15 percent above the 1938 level. Two of the fibers show quantitative gains as compared to prewar--cotton 0.9 pounds, rayon 1.3 pounds--while wool remained exactly the same. Though the gains of cotton are about equal to those of rayon, cotton's relative share declined from 59 percent in 1938 to 56 percent in 1954.

Trends in the consumption of textile products in Western Europe vary greatly from country to country. Rayon made the greatest quantitative gains between 1938 and 1954 in the United Kingdom, its availability increasing from 2.2 to 6.6 pounds per capita, for an aggregate gain of 4.4 pounds. During this period, cotton lost ground--dropping from almost 17.0 to 14.1 pounds per capita. Wool also sustained losses from an average of 7.1 pounds per capita to 5.7.

In West Germany, the per capita availability of rayon products in 1954--6.4 pounds--was second only to that in the United Kingdom. Even so, German rayon was below the 1938 level of 7.1 pounds per capita. Between the same 2 years, cotton gained substantially, rising from 7.3 to 10.8 pounds per capita.

In Italy, per capita availabilities of textile products are among the lowest in Western Europe. Rayon, at 3.1 pounds

per capita in 1954, was still below the 1938 level. Cotton, in the meantime, gained considerably by increasing from 4.4 to 7.3 pounds per capita.

In France and Italy, only moderate gains have been made over the past 16 years in the per capita availabilities of cotton and rayon products. In France, rayon increased from 1.1 pounds per capita in 1938 to 3.3 pounds in 1954; in Italy, it declined over the same period from 3.3 to 3.1 pounds per capita. Cotton products rose in France by about 12 percent but in Italy by over 60 percent. It is significant that cotton consumption represents a higher percentage of total textile fiber consumption in Italy and France than in other Western European countries--over 60 percent in Italy and France, as compared with 56 percent for Western Europe as a whole.

Compared to 1938, total per capita fiber availabilities in Belgium and Luxembourg in 1954 actually declined. Cotton and wool have lost, while rayon has gained enough to approximate the Western European per capita average.

Total per capita fiber availabilities in the Netherlands have increased significantly from 17.3 to 22.3 pounds. On a poundage basis, rayon and wool increased while cotton merely held its own; relatively, cotton lost to rayon and wool.

Spain has doubled per capita fiber availabilities from a meager 4.9 pounds near the end of the Spanish Civil War in 1938 to 9.5 pounds in 1954. All three fibers have gained quantitatively in the Spanish market, but most of the expansion has been accounted for by rayon, which increased 2.2 pounds per capita, and by cotton, which increased 2 pounds per capita.

A comparison of trends in the textile consumption patterns of Western Europe with those in the United States is important in developing perspective concerning the competitive and complementary relationships among the textile raw materials. Trends in per capita fiber availabilities in Western Europe have been similar to those in the United States; however, cotton has lost more ground to other fibers in the United States than in Western Europe--even though per capita availability of cotton in the United States increased from 21.4 pounds in 1938 to 24.3 pounds in 1954. Rayon in the United States increased from 2.4 pounds per capita in 1938 to 6.4 pounds in 1954--the same as in West Germany and very nearly the same as in the United Kingdom. In the United States, cotton's position among the three fibers dropped from 82 percent of the total in 1938 to 73 percent in 1954, while in Western Europe cotton's share dropped from an average of 59 percent to 56 percent.

Since 1938, cotton has improved its relative position in West Germany and Italy, held on tenaciously in France, and

lost ground more than average in the United Kingdom, Belgium, the Netherlands, and Spain.

### Consumer Preferences for Textile Fibers

Throughout Western Europe there is strong consumer resistance to rayon and synthetic textiles, particularly in the apparel field. This resistance is especially strong against fiber blends. Resistance to rayon and other synthetic fabrics and fabric blends is the result of consumers' wartime experience. During the war, consumers were forced by lack of choice to use rayon clothing. At that time, rayon was used for many purposes for which it was not suitable. Even though significant improvements have been made in the finishing of rayon textiles since World War II, consumers' attitudes toward rayon and rayon blends and mixtures have been slow to change.

In England, sound planning, vigorous research in use and development, and strong promotional efforts of individual companies and industry associations have contributed greatly toward overcoming the resistance of British consumers to rayon and synthetic fibers. On the Continent, progress has also been made in overcoming the resistance of consumers; but, even with significant improvements in fiber properties, dyeing, and finishing, it has been a difficult job to convince consumers that the rayon and synthetic fabrics of today are superior to those they had to accept during wartime.

## INFLUENCE OF GOVERNMENT POLICIES ON COMPETITIVE POSITION OF COTTON, RAYON, AND ALL OTHER SYNTHETIC FIBERS

Contrary to general opinion there is no positive proof that the industry producing rayon and other synthetic fibers is currently getting from governments of the major textile-producing countries of Western Europe any direct material assistance that would tend to discriminate in favor of the production of such fibers over the natural fibers. In fact, both cotton and rayon industry leaders in Western Europe contend that the synthetic-fiber industry has not received any direct government assistance for the last 5 or 6 years. This appraisal is substantiated by a recent survey that the Secretariat of the International Cotton Advisory Committee



made on governmental policies affecting consumption of all synthetic fibers.<sup>5</sup>

Portugal is the only case that can be cited where a Western European government has given special tax concessions or depreciation allowances to firms manufacturing rayon and other synthetic fibers, as has been done in the United States and Japan. Neither is there proof that other Western European governments have given special financial assistance in the construction of manufacturing facilities for rayon and other synthetic fibers since World War II. The special treatment given to firms in the United States and Japan may be responsible for the impression that governmental assistance has been available more generally in Western European countries than it actually has.

Western European officials point out that immediately after the war government assistance was received to some extent by almost all segments of the economy. They emphasize, however, that the early postwar assistance was not discriminatory and that cotton benefited on equal terms with rayon and the other synthetic fibers. Special governmental assistance for the rayon industry has not been needed in the past 2 or 3 years because natural-fiber prices have been high enough to insure a wide price advantage for rayon staple fiber.

The effect that lower cotton prices will have in the future on the attitude of leaders in the rayon industry toward special governmental assistance is difficult to assess at this time. A director of one large rayon staple fiber producing firm in Western Europe has pointed out that if foreign cotton-producing countries get into a price war and cotton prices drop and remain low in relation to rayon staple fiber for a long period of time, rayon staple fiber producers might find it necessary to make strong overtures to their governments for protection or countervailing action.

### Dollar Allocations and Exchange Permits

Although at the present time there is no proof of direct assistance to the synthetic fiber industry during the last 5 or 6 years, considerable indirect assistance has undoubtedly accrued to the advantage of rayon staple fiber producers. For instance, there is reason to believe that the manner in which governments have allocated foreign exchange for

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<sup>5</sup>Secretariat of the International Cotton Advisory Committee. Report on Governmental Policies as They Affect Consumption of Cotton and Man-Made Fibers. [Unpublished working paper. Washington. 1956.]

cotton procurement and the procedures followed in issuing import licenses have been of some benefit to producers of rayon and other synthetic fibers.

During the acute dollar shortage in Western Europe, the licensing system and the allocation of dollars for the purchase of raw cotton provided a stimulus to rayon producers, since foreign exchange was not available to purchase all the cotton required by the mills. This situation has improved greatly in the last 2 years, especially in West Germany, the Netherlands, Belgium, and England. The allocation of foreign exchange is still, however, an important consideration in countries such as Italy, France, and Spain.

The timing of governments' announcements of dollar allocations for the purchase of cotton in Italy and France seriously impairs the cotton industry's ability to buy cotton when the desired qualities are available and when prices are the lowest. A further complication in France is the government's requirement that the French cotton industry give preference to the purchase of cotton from countries with which France has entered into trade clearing agreements. This requirement results in higher mill costs for raw cotton, ranging up to 10 percent above world prices. The French cotton industry contends that this system hurts the country's competitive position in the textile export market.

In the allocation of foreign exchange for imports and the procurement of licenses, the synthetic-fiber industry generally has fared better than the cotton industry, for two reasons. First, a considerable proportion of the raw materials used for manufacturing rayon and the other synthetics have been available from soft currency sources; and second, when free dollar allocations have been required, they have usually been more easily obtained than if they were being requested to purchase raw cotton.

### Spain and Portugal—Special Cases

The situation found in Spain and Portugal is entirely different from that found in Western Europe generally. Spain is a country with limited foreign exchange resources. The Spanish Government determines the amount of foreign exchange available for cotton procurement, buys the cotton, and fixes the price to the cotton spinners at a level far above the purchase price. For the last few years, the price of cotton has been more than 23 cents a pound above the price of rayon staple fiber. Recently, cotton prices to the Spanish textile industry were reduced, but even after the reduction the margin in favor of rayon staple is about 17.6 cents a pound—higher than in any other country for which information is available. This spread has been large enough to



stimulate both the production of rayon staple fiber and the rapid expansion of domestic cotton production. Profits made by the government's cotton monopoly are very substantial, an estimated \$18 million to \$20 million annually. These profits have been utilized to subsidize other agricultural production and exports as well as domestic cotton production.

In Portugal, the government has encouraged the construction of rayon and acetate production facilities by offering tax concessions and depreciation allowances. However, the Portuguese industry is still very small, with a total capacity not much above 13 million pounds annually. The government also maintains strict control over all cotton imports and gives preference to cotton produced in colonial territories.

### Government Aid to Textile Exports

In addition to the indirect measures available to the chemical fiber industry, some countries employ direct measures to stimulate textile exports. On exports to certain destinations, the French Government rebates part of the special employment and social security taxes that are applicable in Metropolitan France. In addition, for a number of years French fiber producers have aided the export of rayon textiles by a preferential export pricing policy. These special considerations have helped the French industry develop and hold foreign outlets for rayon fabrics, so that exports have been amounting to about one-fourth of the country's entire production. The French contend that such compensation by the French manufacturers and the government is absolutely essential to permit French goods to compete in world markets.

Government aid is even more direct in Italy. The domestic price level in Italy, plus the complicated network of taxes, employment benefits, and government regulations in general, makes it impossible for almost any Italian industry to compete in the export market without such aid. In regard to textiles, the Italian Government permits the refunding of most of the special government taxes and processing charges on all exports of fibers, yarns, and textiles, both rayon and cotton. Without some such provision the Italian industry would have no hope of meeting competition in the export market.

### Trade Restrictions on Textile Fiber Imports

Most Western European countries that are major producers of rayon and other synthetic fibers impose duties on the imports of rayon staple fiber, rayon filament, and other synthetic fibers (see table 5).

TABLE 5.--Rayon staple, rayon filament, and other synthetic fibers: Import duties in selected Western European countries, 1956

Country	Cotton	Rayon staple fiber	Other synthetic staple and filament
	<u>Percent ad valorem</u>	<u>Percent ad valorem</u>	<u>Percent ad valorem</u>
Benelux <sup>1</sup> .....	20	26	26
France .....	0	18	22
Germany, West .....	0	13	15
Italy .....	36	413	410
	<u>Cents per pound</u>	<u>Cents per pound</u>	<u>Cents per pound</u>
Norway .....	0	1.3	1.3
Sweden .....	0	61.3	61.3
Switzerland .....	7.021	7.053	7.053
United Kingdom .....	0	10.5	10.5

<sup>1</sup>Belgium, Netherlands, Luxembourg.

<sup>2</sup>In the Netherlands, a 2-percent import tax of duty and duty-paid value was scheduled to be reinstated on Jan. 1, 1957; in Belgium, a 5-percent transmission tax of duty-paid value is applied in addition to the 6-percent tariff.

<sup>3</sup>Conventional rate on imports from the United States and all countries having most-favored-nation agreements with Italy.

<sup>4</sup>Temporary rate, renewable annually.

<sup>5</sup>0.2 crown per kilogram (1 crown = 14.1 cents).

<sup>6</sup>15 crowns per 100 kilograms (1 crown = 19.3 cents).

<sup>7</sup>0.2 Swiss franc per 100 kilograms for cotton; 0.5 for rayon and other synthetic staple and filament (1 Swiss franc = 23.4 cents).

<sup>8</sup>9 pence per pound (1 penny = 1.17 cents).

U. S. Department of Commerce.

The highest duties are imposed by the principal textile-producing countries. Individual countries levy duties on imports of rayon and other synthetic fibers for the purpose of protecting the domestic industry. The rate of duty on imports of rayon staple in the United Kingdom is prohibitive at 9 pence per pound (10.5 cents), which at current prices in the United Kingdom is equivalent to an ad valorem rate of about 37 percent. In France, West Germany, and Italy the ad valorem duty is moderately high, ranging from 13 percent in Italy and West Germany to 18 percent in France. In the Benelux area the duty on rayon staple and filament imports is a moderate 6 percent; however, additional taxes are applied in the Netherlands and Belgium. The specific duties that Sweden and Norway impose on rayon staple imports are moderate also—at present prices, the equivalent of about 5 percent ad valorem. The specific duty imposed by Switzerland is nominal. Austria and Denmark impose no import duties whatsoever on rayon staple or any other synthetic fiber.

The duty structure on rayon staple is such that trade among the principal textile-producing countries in Western Europe

is discouraged. The relatively high duties ranging from 4 to 10.5 cents a pound in the major textile countries leave room for substantial variations in domestic rayon prices from one country to another without permitting lower priced imports to endanger domestic production.

In those countries with extremely low ad valorem duties or none, domestic prices of rayon staple and synthetic fibers are usually lower than in the principal textile-producing countries, which are, of course, the principal rayon-producing countries. Tariffs on the imports of rayon and the other synthetic fibers actually encourage higher domestic prices for such fibers than if imports were permitted to enter duty free. It is a well-known fact that competition in the export market for rayon and the other synthetic fibers is keener than in domestic markets. As a result, prices of rayon in world trade are usually lower than in the domestic markets where the rayon is produced.

In contrast to rayon, cotton is duty free in practically all countries except Italy.

Trade restrictions other than tariffs exist in France, Italy, West Germany, and the United Kingdom. Quantitative restrictions in the form of import quotas, sometimes tied to bilateral trade agreements or exchange controls, are applied in France and Italy for raw cotton, dissolving wood pulp, staple fiber, and cotton and rayon yarns. In France, these controls are framed to give special consideration to imports from French overseas territories and OEEC countries; in Italy, on the other hand, controls are directed against dollar areas, except where bilateral trade agreements exist.

West Germany's quantitative controls are limited to imports from dollar sources of staple fiber, cotton yarn, and all types of rayon and synthetic fiber yarns, except synthetic filaments. In the United Kingdom, however, dissolving wood pulp is added to the above list of textile raw materials covered by quantitative controls. Raw cotton is conspicuously free from quantitative restrictions in Belgium, West Germany, the Netherlands, and the United Kingdom.

# UNITED STATES IMPORTS OF RAYON STAPLE FIBER

## Volume

Imports of rayon staple fiber into the United States rose to an all-time high level in 1955. Western Europe was the principal source of such imports, and practically every country producing rayon staple participated in the expanding United States market (see table 6).

In 1955 United States imports reached 171.8 million pounds--nearly three times the quantity imported in 1954. In 1955, the principal suppliers in order of volume were West Germany, the United Kingdom, France, Italy, and Belgium. During the first 4 months of 1956, however, imports dropped far behind the volume recorded during the same months in 1955--35.9 million pounds as compared with 58.7 million pounds, or a decline of 39 percent.

TABLE 6.--Rayon staple fiber: Imports into the United States, by country of origin, 1954 and 1955

Area and country of origin	1954			1955		
	Quantity	Value	Value per pound	Quantity	Value	Value per pound
Western Europe:	<u>Pounds</u>	<u>Dollars</u>	<u>Cents</u>	<u>Pounds</u>	<u>Dollars</u>	<u>Cents</u>
Germany, West .....	7,864,893	2,127,960	27	35,885,480	10,073,747	28
United Kingdom .....	5,460,730	1,555,918	28	24,915,250	6,986,264	28
France .....	15,557,860	4,637,469	30	24,761,968	6,413,230	26
Italy .....	1,702,533	469,102	28	20,961,661	5,128,558	24
Belgium .....	8,402,192	2,231,197	27	14,861,464	3,972,733	27
Norway .....	5,025,386	1,333,055	27	14,279,126	3,778,656	26
Austria .....	2,256,463	511,239	23	10,086,120	2,467,325	24
Switzerland .....	3,566,175	917,021	26	9,810,362	2,568,968	26
Sweden .....	800,190	188,699	24	8,302,251	2,008,400	24
Netherlands .....	82,609	28,279	34	482,239	140,722	29
Total .....	50,719,031	13,999,939	28	164,345,921	43,538,603	26
North America:						
Canada .....	34,643	10,353	30	1,584	492	31
Cuba .....	7,354,600	2,161,952	29	6,495,661	1,966,192	30
Total .....	7,389,243	2,172,305	29	6,497,245	1,966,684	30
Japan .....	7,135	3,055	43	978,700	259,406	27
World total .....	58,115,409	16,175,299	28	171,821,866	45,764,693	27

Computed from Bureau of the Census, Report No. F.T. 110, U. S. Imports of Merchandise for Consumption, Commodity Classification No. 3810020, "Filaments not over 30 inches in length except waste, cellulosic only."



The significant expansion of rayon staple imports by the United States in 1955 is characterized by the following important highlights:

First, although United States producers operated practically at maximum capacity, the demand for rayon staple fiber in the United States at prices from 1 cent to 2 cents a pound below official quoted United States domestic prices left a vacuum that could be filled only by imports.

Second, nearly all Western European rayon staple producing countries responded to this temporary situation, increased their production to near capacity levels, increased their exports to the United States to nearly three times the volume in the previous year, and thereby profited materially throughout 1955.

Third, most foreign suppliers recognized that the high level of exports to the United States in 1955 was a temporary situation, especially in view of the fact that the domestic rayon staple fiber industry in the United States was proceeding with a significant 25 percent expansion in plant capacity that would be completed by the end of 1957.

Foreign producers in several important Western European producing countries readily admit that exports to the United States in 1955 were a major factor contributing to a successful year. Realizing that the United States market was only temporary, a major Italian firm, in its 1955 report to stockholders, stated:

... the main staple fiber export markets have been U.S.A., U.S.S.R., Syria, Yugoslavia, Roumania, etc. The remarkable volume of exports to the U.S.A. market is undoubtedly to be accounted for by the economic expansion which occurred there in 1955; but regrettably these exports took place at extremely low prices, and will not be fully repeated in 1956. For this reason steps have been taken to engage closer connections with the U.S.S.R. and with other markets beyond the Iron Curtain, with a view to providing alternative markets to the U.S.A. which may, in part, be lost.<sup>6</sup>

Commenting on the large volume of rayon staple exports to the United States in 1955, a leading producer in England, in its annual report to the stockholders in 1956, also observed the temporary nature of United States import demand in 1955. The report stated:

... The production and sale of our staple fiber reached a new high level; large quantities were exported to the United States of

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<sup>6</sup>SNIA Viscosa, 38th Financial Year, January 1-December 31, 1955. 48 pp., illus. Milan. 1956.

America but, owing to the increase in capacity of the American rayon producers, there are already signs of falling off in demand and it is doubtful if the level of exports to the American continent will be maintained.<sup>7</sup>

It can only be concluded that the large expansion of rayon imports into the United States in 1955 was due to increased demand and to the fact that import values were low enough to pay costs, insurance, and freight plus the import duty and still meet competition of United States producers. The wide price advantage that rayon staple fiber has over cotton in the United States, plus the technical adaptability of rayon staple fiber in the tufted carpet industry, were primary reasons behind the increased demand for imported rayon in 1955. United States firms are expanding rapidly to be able to supply the domestic market.

### Value

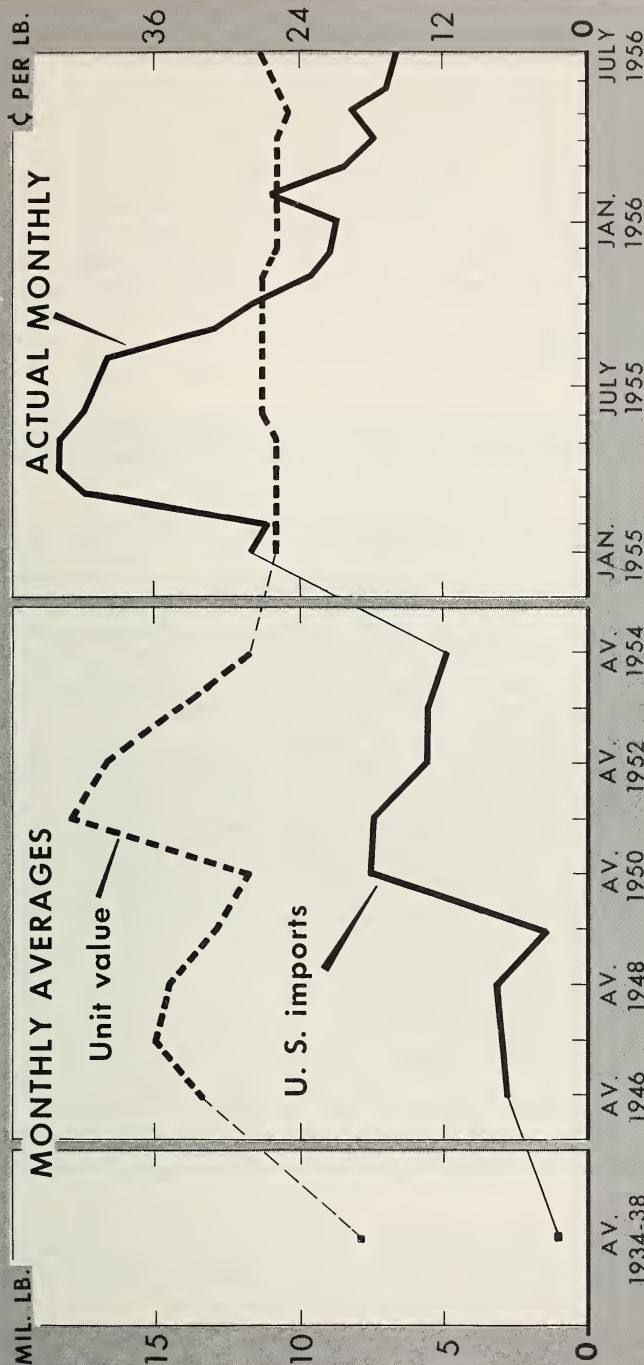
The value of United States rayon staple imports has been calculated from U.S. Department of Commerce data on imports of merchandise for consumption (see table 6). The average unit value of imports in 1955 was slightly lower than in 1954--27 cents as compared to 28 cents.<sup>8</sup> Substantial quantities of carpet staple and dope-dyed staple, which command a premium over the price of bleached apparel staple, are being imported into the United States. Imports of carpet staple from some Western European countries represent a sizable share of total United States imports of the country's cellulosic staple, as shown by the following figures, relating to shipments during the last half of 1955: Sweden, 30 percent; Italy, 30 percent; Austria, 45 percent; Netherlands, 68 percent; and West Germany, 69

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<sup>7</sup>Courtaulds, Ltd. Report and Accounts 1955-1956. 20 pp. London. 1956.

<sup>8</sup>Unit values for U.S. imports used in this report were calculated from aggregate quantity and value data published by the Bureau of the Census, as Schedule A number 3810020, "Filaments not over 30 inches in length, except waste, cellulosic only," in U.S. Imports of Merchandise for Consumption, F.T. 110. Since this schedule A number includes all types and grades of cellulosic staple, it is recognized that these unit prices are not valid when interpreted as relating to a single quality or type of staple. This limitation should be kept in mind when these data are used. It is believed, however, that these calculated unit prices are the best that can be obtained at the present time.

# RAYON STAPLE FIBER : Monthly U. S. imports and average unit value



SOURCE : BUREAU OF THE CENSUS, U. S. IMPORTS OF MERCHANDISE FOR CONSUMPTION

percent. The calculated unit prices for these countries undoubtedly are not comparable with those of countries from which little or no high priced carpet staple originated.

In 1955, the calculated average values of all cellulosic staple fiber imports from West Germany, the United Kingdom, Belgium, and the Netherlands were above the average value of staple fiber imports from all countries, while the lowest unit values were found among the imports from Sweden, Austria, and Italy, even though large quantities of carpet staple, at 2-1/2 to 3-1/2 cents a pound higher than apparel staple, were imported from each of these countries. It is of interest to note that these three countries made great relative gains in the United States market in 1955. Lower export prices were probably a major contributing factor.

The average prices of United States cellulosic staple fiber imports have been declining since 1951 (see table 7).

TABLE 7.--Rayon staple fiber: Calculated value per pound of United States imports, by country of origin, 1947-56<sup>1</sup>

Area and country	All types of staple fiber							Cellulosic fiber only		
	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956 <sup>2</sup>
Western Europe:	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
Austria .....	0.39	-	0.53	0.26	0.34	0.38	0.24	0.23	0.24	0.22
Belgium .....	.38	0.32	.33	.30	.45	.40	.33	.27	.27	-
Czechoslovakia .....	.40	.40	.42	-	-	-	-	-	-	-
Finland .....	.36	-	-	.29	.40	-	.35	-	-	-
France .....	.35	.37	.39	.30	.47	.47	.38	.30	.26	.24
Germany, West .....	-	.41	.31	.27	.49	.51	.40	.27	.28	.30
Greece .....	-	-	-	-	.45	.35	-	-	-	-
Italy .....	.49	.37	.41	.36	.48	.51	.30	.28	.24	.26
Netherlands .....	.38	.36	.33	.27	.40	.38	.31	.34	.29	-
Norway .....	.38	.45	.32	.20	.37	.33	.29	.27	.26	.29
Spain .....	.50	.50	-	-	-	.23	.23	-	-	-
Sweden .....	.31	-	-	.25	.37	.44	.35	.24	.24	.22
Switzerland .....	.38	.31	.30	.27	.40	.35	.30	.26	.26	.24
United Kingdom .....	.33	.31	.26	.24	.33	.33	.36	.28	.28	.27
North America:										
Canada .....	.96	5.03	1.67	.36	.41	.41	.35	.30	.31	-
Cuba .....	-	-	.35	.37	.50	.38	.30	.29	.30	.34
Mexico .....	-	1.31	-	-	.45	.57	-	-	-	-
Asia:										
Japan .....	-	-	.29	.26	.36	.34	.27	.43	.26	-
Korea .....	-	-	-	.16	.16	-	-	-	-	-
Average, all countries ....	.36	.35	.31	.28	.43	.40	.34	.28	.27	.27

<sup>1</sup>Import values per pound calculated by dividing total value of imports by total quantity imported.

<sup>2</sup>January-July.

Computed from Bureau of the Census, Report No. F.T. 110, U.S. Imports of Merchandise for Consumption. For 1947-53, Commodity Classification No. 3810000, "Filaments not over 30 inches in length except waste"; for 1954-56, Commodity Classification No. 3810020, "Filaments not over 30 inches in length except waste, cellulosic only."



Before 1954, average export prices of rayon staple fiber from the major Western European rayon-producing countries were considerably above domestic prices prevailing in the United States. With the return of keen competition in the international market in the last 2 years, rayon staple export prices have fallen considerably below domestic prices in practically all protected home markets. According to some reports, export prices in several Western European countries have fallen to levels which might not be remunerative if an individual firm were required to sell its entire output for export at such prices.

## DOMESTIC AND EXPORT PRICING POLICIES

Domestic and export pricing policies employed by foreign producers of rayon staple and other synthetic fibers have an important relationship to production policies. In evaluating the probable reactions of management to changing economic conditions, an understanding of the following factors and their inter-relationships is helpful: (1) Tariffs and other protective trade measures that encourage selective pricing between the home and the foreign market; (2) full or partial operation of available capacity as related to efficiency in production and consequently to unit production costs; (3) the necessity of meeting competitive prices in export outlets, including payment of import duties that may be levied by individual importing countries.

Most rayon and other synthetic fiber producers practice selective pricing of their products among their numerous consumers. This is a common and logical business practice. Selective pricing is sometimes reflected in the practice of allowing discounts from quoted prices, according to either volume of purchases or method of payment. In domestic markets, prices are usually varied from one consumer to another according to the volume, method of payment, and frequency of orders. Also, there is reason to believe that some firms practice selective pricing to some extent in relation to end uses.

The degree to which selective pricing practices are employed in the export market depends upon the intensity of competition existing in any particular export market and, of course, upon the trade relationships existing between any

two countries, their trade balances, and the overall balance-of-payments position of the countries involved. Unquestionably, rayon producers can benefit by practicing a considerable amount of selective pricing in the export market.

In major producing countries that have protective tariffs or other trade restrictions, domestic prices are higher than export prices. If operating at a high percentage of production capacity reduces unit production costs, an individual producer in a high-tariff country can offer a part of his total production in the export market at or even below cash cost, provided he can sell a sufficient volume at a high enough price in the protected domestic market. Thus, his margin of profit on domestic sales will insure a profit for his entire business operation. In other words, producers under these circumstances can afford to fix their prices on export sales at a break-even level, if by increasing their volume of production they can reduce unit costs and raise the profit margin on domestic sales. Profit margins on export sales can be nonexistent, but as long as export prices are above out-of-pocket costs, this practice can be extremely advantageous to rayon producers. It is this situation that gives rise to the sharp competition for export outlets.

Foreign suppliers must also be in a position to price their product for export low enough to compete in the domestic markets of importing countries after paying import duties where they are applied. For example, imports of staple fiber into the United States are subject to ad valorem duties of 15 percent. On the basis of average import prices as calculated, the United States duty amounts to about 4 cents a pound. To this must be added the cost of insurance and transportation to the United States, which varies depending upon the port of exit, the location of the production facilities within the source country, and the port of entry.

United States producers of cotton and rayon staple fiber have been inclined to view with alarm the recent decline in export prices of rayon staple fiber from Western European countries, especially when such prices have fallen below domestic sales prices in the exporting country. The current low level of export sales prices in these countries gives rise to the supposition that domestic market prices there could also be further reduced and still represent profitable production. This supposition, however, is doubtful. Profitable production does not necessarily require that both cash and total overhead costs be recouped in all cases in the export market. A precise evaluation of this situation at this time is impossible because of inadequate information on (1) the extent to which individual firms practice selective

pricing in both the domestic and export market, and (2) cash and overhead costs of production. It is however, a positive fact that export markets for staple fibers are highly competitive while domestic markets in the major rayon-producing countries are not.

## PRICE COMPETITION BETWEEN RAYON STAPLE FIBER AND COTTON

### Rayon Staple Prices

The price of rayon staple fiber, which is the principal direct competitor of cotton in the bulk of the textile end-use markets, varies widely from one country to another. In some Western European countries, such as the United Kingdom, the Benelux countries, West Germany, and Italy, the domestic price of rayon staple fiber has for a number of years been less than the quoted price of 34 cents a pound in the United States. In others, such as France and Spain, it has averaged higher. Rayon staple prices as quoted for the principal rayon producing countries in Western Europe are presented in table 8.

TABLE 8.--Rayon staple fiber: Average price per pound in the United States and selected Western European countries, crop years 1950-55<sup>1</sup>, June and latest available month, 1956

Country	1950	1951	1952	1953	1954	1955	1956	
							June	Latest month available
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
United Kingdom ....	26.1	30.3	31.3	28.0	28.0	28.0	28.0	<sup>2</sup> 28.0
West Germany <sup>3</sup> .....	29.2	42.7	35.1	31.9	31.9	31.9	31.9	-
France .....	35.8	43.7	38.5	35.8	34.6	33.7	33.7	<sup>4</sup> 31.2
Italy .....	52.1	53.1	36.1	32.0	33.4	30.4	29.2	<sup>5</sup> 27.9
Spain .....	( <sup>6</sup> )	( <sup>6</sup> )	39.0	39.0	39.0	39.0	39.0	-
United States <sup>3</sup> ....	36.1	40.0	39.7	35.0	34.0	33.7	32.0	<sup>7</sup> 32.0

<sup>1</sup>Year beginning August 1.

<sup>2</sup>August.

<sup>3</sup>Calendar year.

<sup>4</sup>October.

<sup>5</sup>July.

<sup>6</sup>Not available.

<sup>7</sup>November.

United Kingdom and Italy, Quarterly Bulletin, International Cotton Advisory Committee; France, Bulletin Mensuel de Statistique, Institut National de la Statistique et des Etudes Economiques; West Germany, Kelheimer Taschenbuch, Sddeutsche Zellwolle, Kelheim/Donau, 1955; Spain, trade sources, estimated; United States, Textile Organon, Textile Economics Bureau, New York.

Rayon staple prices for the Netherlands and Belgium are not reported, since there is only one producing firm in each of these countries. However, rayon staple prices are lower in the Netherlands and Belgium than in France, West Germany, and Spain, and are in line with British prices and world export prices.

Rayon staple sales prices vary widely from one country to another for several reasons. The economic disequilibrium that exists among countries in relation to cost structures, pricing policies, tax policies, and foreign exchange positions contributes to wide variation in rayon prices, especially when such prices are expressed in terms of a common denominator such as the dollar. Also, countries vary in efficiency of rayon staple manufacturing operations. These variations arise from plant layout, type and age of equipment, labor-management policies, and last, but not least, government policies relating to employment and social benefits. Furthermore, since domestic prices are established behind relatively high tariff walls, there is considerable room for variation between domestic and export prices. Tariffs are a major factor contributing to variations in rayon prices from one country to another.

### Comparison of Rayon Staple and Cotton Prices

During the latter part of 1955 and early 1956, foreign-grown cottons were sold at prices as much as 9 cents a pound below United States cotton. The relatively low price of foreign-grown cottons improved the competitive position of these cottons vis-a-vis United States cotton and narrowed the price margin between foreign cotton and rayon staple fiber in Western Europe. While this margin was narrowing, the disparity between United States cotton and foreign rayon staple fiber was unaffected. As a result, not only did United States cotton fail to meet the lower prices of foreign cotton throughout 1955, but the gap between the price of United States cotton and foreign rayon staple was maintained rigidly.

Beginning on January 1, 1956, United States cotton with staple lengths of less than 31/32 inch was sold for export at prices below those prevailing in the United States domestic market. After August 1, 1956, all grades of United States upland cotton were sold at prices competitive with foreign cottons. Therefore, since the beginning of 1956 United States cotton has improved its price position not only with foreign-grown cotton, but also with foreign rayon staple fiber. This improvement took place first in the shorter staples, which compete with rayon staple within a rather narrow range of the entire fiber market. After



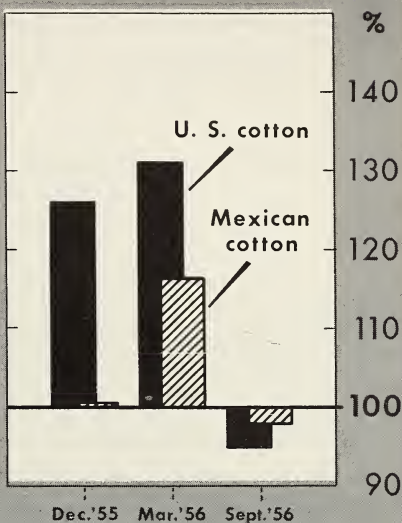
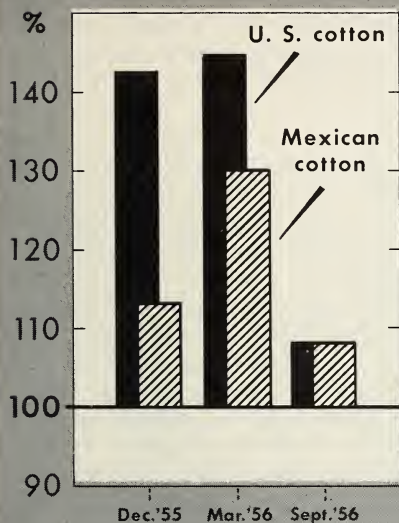
# PRICE RELATIONSHIP OF COTTON TO RAYON STAPLE FIBER

in selected foreign markets

( Price of rayon staple=100 )

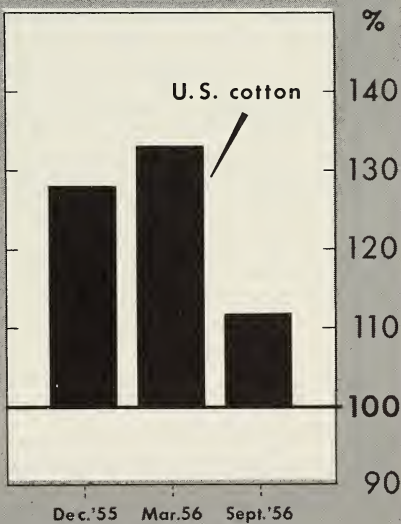
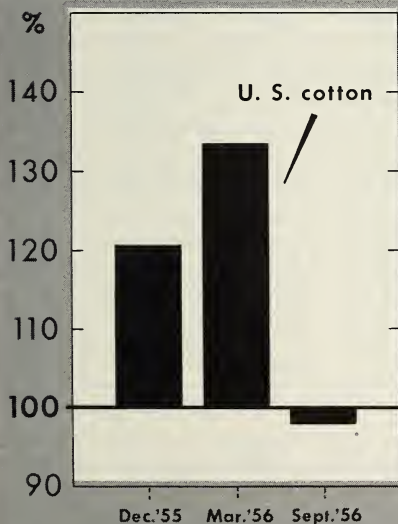
UNITED KINGDOM

WEST GERMANY



FRANCE

ITALY



August 1, 1956, all upland cotton staple lengths and grades covering the entire range of the textile market were sold for export at prices competitive with foreign cottons.

A comparison of rayon staple fiber and raw cotton prices in the major producing countries since early 1955 indicates the significant change that has occurred in the price relationships among these fibers in the last year and a half (see table 9).

In the United Kingdom, the December 1955 price of U.S. Middling 1-1/32-inch was approximately 11.9 cents above the price of staple rayon fiber, compared with a premium of only 3.7 cents for the equivalent staple and quality of

TABLE 9.--Raw cotton and rayon staple fiber: Price per pound in selected Western European countries and the United States, specified periods

Country	December 1955	March 1956	September- October quotations 1956
United Kingdom:	<u>Cents</u>	<u>Cents</u>	<u>Cents</u>
U.S.M. 1-1/32 (c.i.f. Liverpool) .....	<sup>1</sup> 39.9	40.5	30.2
Rayon staple fiber .....	28.0	28.0	28.0
Price difference in favor of rayon .....	11.9	12.5	2.2
U.S.M. 15/16 (c.i.f. Liverpool) .....	<sup>1</sup> 37.3	30.7	27.8
Rayon staple fiber .....	28.0	28.0	28.0
Price difference in favor of rayon .....	9.3	2.7	-.2
Mexican 1-1/32 (c.i.f. Liverpool).....	<sup>1</sup> 31.7	36.4	30.2
Rayon staple fiber .....	28.0	28.0	28.0
Price difference in favor of rayon .....	3.7	8.4	2.2
Germany, West:			
U.S.M. 1-1/32 (c.i.f. Bremen) .....	<sup>1</sup> 40.1	41.8	30.2
Rayon staple fiber .....	31.9	31.9	<sup>2</sup> 31.9
Price difference in favor of rayon .....	8.2	9.9	-1.7
Mexican ML-1/32 (c.i.f. Bremen) .....	<sup>1</sup> 32.0	37.1	31.2
Rayon staple fiber .....	31.9	31.9	<sup>2</sup> 31.9
Price difference in favor of rayon .....	.1	5.2	-.7
France:			
U.S.M. 1-1/32 (c.i.f. LeHavre) .....	40.6	45.0	<sup>3</sup> 30.6
Rayon staple fiber .....	33.7	33.7	31.2
Price difference in favor of rayon .....	6.9	11.3	-.6
Italy:			
U.S.M. 1-1/32 (c.i.f. Italian port) .....	39.0	40.5	<sup>3</sup> 31.1
Rayon staple fiber .....	30.5	30.5	<sup>2</sup> 27.9
Price difference in favor of rayon .....	8.5	10.0	3.2
Spain:			
U.S.M. 1-1/32 (c.i.f. Spanish port) .....	62.4	62.4	56.6
Rayon staple fiber .....	39.0	39.0	<sup>2</sup> 39.0
Price difference in favor of rayon .....	23.4	23.4	17.6

<sup>1</sup>Prompt shipment for January delivery.

<sup>2</sup>Based on assumption that rayon prices held to August 1956 levels.

<sup>3</sup>Estimated on basis of September-October quotations, past relationships of prices c.i.f. European port, and the assumption that full reduction in U.S. sales price was passed on to spinners.

Mexican cotton. The special United States export program for short-staple cotton initiated on January 1, 1956, narrowed the price spread between rayon staple and U.S. Middling 15/16-inch from 9.3 cents a pound in December 1955 to 2.7 cents in March 1956. As a result of the United States export sales policy initiated in 1956, U.S. Middling 1-1/32-inch by August 1, 1956, was quoted for September-October delivery at 30.2 cents, c.i.f. Liverpool--the same as for comparable Mexican cotton. American type M 1-1/32-inch cotton was thus only 8 percent, or 2.2 cents per pound, higher on a gross weight basis than rayon staple fiber--the smallest price advantage that rayon staple has had in England for many years. If British rayon staple prices continue firm, the difference in price between rayon staple fiber and American type M 1-1/32-inch cotton will be favorable for cotton in the coming year.

In West Germany, where domestic rayon staple fiber prices average nearly 4 cents a pound above United Kingdom prices, cotton's price disadvantage prior to September 1956 was less than in the United Kingdom. In December 1955, the difference between the price of rayon staple fiber and Mexican Middling 1-1/32-inch was less than a cent a pound. In the spring of 1956, Mexican prices strengthened for the medium staple lengths, and the difference in favor of rayon staple widened to about 5 cents a pound. This was also true of most other foreign growths. The prices of United States cotton, which were considerably above the prices of comparable foreign growths, were 8.2 cents higher than rayon staple prices in December 1955 and 10 cents higher in March 1956. If rayon staple prices are not lowered to meet lower cotton prices prevailing after September 1956, the price of American-type Middling 1-1/32-inch cotton will be below the domestic price of rayon staple fiber in West Germany, where prices have been held at a constant level of 31.9 cents a pound since early in 1953.

In France, until September-October 1956, the price advantage of rayon staple fiber over United States cotton was about the same as in West Germany and Italy, but somewhat less than in the United Kingdom. Rayon staple price quotations in France have averaged about 2 cents a pound higher than in West Germany, from 3 to 7 cents higher than in Italy, and about 6 cents higher than in England. The price disparity between rayon staple and United States raw cotton in France during the last year and a half ranged from 7 cents in favor of rayon staple in December 1955 to over 11 cents in March 1956, when marketable supplies of higher quality medium staple cottons became scarce. Under the United States export pricing policy for 1956-57, prices of

U.S. Middling 1-1/32-inch, c.i.f. Le Havre, for September delivery, were below 31 cents a pound. In August 1956 the price of rayon staple fiber in France was reduced from 33.7 cents to 31.2 cents a pound. Despite this reduction, however, U.S. Middling 1-1/32-inch cotton had a price advantage over rayon staple in France of nearly 0.6 cent a pound. An early adjustment in the French market was inevitable because the price differential between the two fibers was greater than in most other countries. It is impossible to predict at this time how much further French rayon prices may be reduced to meet the competition of cotton.

In Italy, the price quotations for rayon staple fiber, which have been about 30.5 cents per pound since 1954, have recently dropped to less than 28 cents a pound. However, it is general knowledge that actual prices paid by spinners were somewhat less than quoted prices during the last year or so, because of the variable discounts they commonly receive depending upon the size and frequency of orders and the terms of sale. Quotations for September 1956 delivery of U.S. Middling 1-1/32-inch cotton were about 31.1 cents per pound c.i.f. Italian port--only 0.6 of a cent above the prices that have prevailed for rayon staple over the past year or so, but 3.2 cents above the newly-announced prices for rayon staple. This represents a substantial change in the price relationship that has existed between rayon and cotton during the past year and a half when United States cotton had a price disadvantage of 8 to 10 cents a pound.

In Spain, rayon staple fiber prices have been fixed at the equivalent of 39 cents per pound since 1952. Cotton prices, which are determined by the government cotton monopoly, have also been fixed. The average price of United States cotton to spinners was fixed at 62.4 cents a pound early in 1953 to June 1956, when it was reduced to 56.6 cents per pound. Under the new price announced in June 1956, rayon staple fiber enjoyed an advantage of 17.6 cents a pound, compared with 23.4 cents a pound during the past several years. The price advantage of rayon staple in Spain is larger than in any other important textile-producing country for which records are available. Under the system of controlled prices in Spain, rayon production has been extremely profitable and significant expansion in production capacity has taken place. Nothing of an economic nature can be done to improve the competitive position of cotton in relation to rayon as long as the government continues to regulate prices.



## Cotton and Rayon Staple Pricing Policies

Recent developments in United States Government cotton export pricing policy will have a significant effect on cotton and rayon price relationships for the remainder of 1956-57--for that matter, far into the future. Also, it is reasonably safe to conclude that the sales prices of practically all foreign cotton will be influenced by the competitive export pricing policy of the United States Government. It is too early to know how foreign rayon producers will react to lower competitive cotton prices. As of October, Italy and France were the only countries that had reduced rayon staple prices to meet lower cotton prices.

The information available on costs of producing rayon staple is insufficient for determining the extent to which rayon staple producers could reduce prices and maintain profitable operations. Neither is there a factual basis for estimating how much the consumption of cotton might gain at the expense of rayon staple fiber at expected new competitive price relationships in the 1956-57 season. Informed textile people believe that cotton's gain against rayon in the short run would be relatively small. If this opinion is correct, rayon producers would not gain materially by reducing prices. In fact, their financial interest may require maintenance of prices and profit margins even though temporary reductions in their volume of production are necessary.

Company profits depend upon the margin between costs and prices. If rayon producers find they must operate at a high level of capacity and reduce sales prices greatly in order to meet lower cotton prices, they might encounter greater difficulties than if they adjusted their production schedules to maintain a margin of profit between unit costs and sales prices. One thing is reasonably certain. Increased competition between cotton and rayon staple fiber in domestic markets will almost surely intensify competition among the world's rayon producers in the export market--a market which is already highly competitive.

## DEVELOPMENTS IN FIBER BLENDING

The term "blending" as used in the manufacture of textile products means the mixing of two or more kinds of fibers in yarns or in fabric constructions. Blending can be accomplished in several ways. Slivers of two or more

fibers can be blended into yarn in the mixing room or on the drawframe. Pure yarns of cotton, rayon, or other synthetic fibers can be blended in the weaving process by the use of two or more kinds of yarns in the warp and weft. Refinements of these methods are found in the preparation of ply yarns by twisting two or more strands of pure yarns, and in the manufacture of core yarns, for which one kind of single yarn is wound around a core made of another raw material.

## Factors Encouraging Fiber Blending

Many factors are responsible for the trend toward increased blending. Some of the most effective research organizations have stressed the importance of "suitability of purpose" in the development of fiber blends--the objective being to utilize the fibers only in blends that meet the "standards of performance" required in particular end uses. Not all blending has been done with this objective in mind. In the past, numerous other factors have in fact encouraged the practice of blending fibers without particular regard to "suitability of purpose." From such blending, the poor quality of the end products has resulted in considerable consumer resistance.

Some of the more important factors that have encouraged the practice of blending rayon staple and cotton since World War II are (1) the shortage of foreign exchange to purchase raw cotton, (2) the nationalistic considerations concerned with the development of domestic industries to achieve greater self-sufficiency and to increase domestic employment opportunities, and (3) the price disparity between raw cotton and rayon staple fiber, which has encouraged the substitution of rayon staple for cotton.

The shortage of foreign exchange in the postwar period was an important factor encouraging the use of domestically produced rayon staple fiber over that of imported raw cotton. In England, foreign exchange requirements for producing a pound of viscose rayon staple are estimated at no more than 11.7 cents a pound, whereas the foreign exchange requirements for importing a pound of cotton range from 30 to 40 cents or higher.<sup>9</sup> However, many other countries must import a substantial amount of the raw materials required in the production of chemical fibers--especially dissolving wood pulp and, to a lesser degree, certain chemicals. When serious foreign exchange shortages exist, there is validity to the position that the drain on foreign exchange must be

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<sup>9</sup>Viscose Staple-Cotton Blends. Textile Mercury and Argus [Manchester, England] 134:786. 1956.

minimized, but when the balance-of-payments position of a country is good, the argument is pointless.

Some countries consider rayon staple fiber their "national" fiber and make the argument that its use should be encouraged over that of cotton because its production provides domestic employment. Actually, however, labor represents a relatively small percentage of the total cost of production in the chemical fiber industry, as compared to the cotton textile industry. In most cases, the cost of labor is not much more than 10 percent of the total cost of production, a fact usually ignored by those who believe that rayon staple fiber production provides substantial domestic employment. The nationalistic argument has some basis in fact, but is usually subjective and overstated.

Many cotton textile people believe that the crucial point of price competition is at the mill door. To the extent that yarn spinners make the decision as to which fiber will be used, the relative prices of cotton and rayon staple fiber may be highly significant in determining which of the fibers are to be spun and the extent to which they may be blended. Unquestionably, disparities in raw material prices of substitutable fibers are a major factor encouraging fiber blending. For a number of years rayon staple fiber in Western Europe has generally been 15 to 40 percent cheaper than raw cotton. This being so, the costs of manufacturing yarn can be reduced by the use of a mixture of the two fibers rather than by using cotton only.

### Passing on Lower Raw Material Prices

If the price advantage of one of the fibers used in a blend is passed on through all subsequent stages of processing, lower fabric costs will result, which theoretically should be reflected in lower finished goods prices to consumers and thereby stimulate consumption. But if the lower fiber costs do not speedily and fully find their way to the consumer, the reduction of the raw material price will not increase consumer interest, but will only increase processing margins and encourage the use, at the manufacturing stage, of the cheaper fiber, whether it be cotton or rayon.

It is general knowledge that from 10 to 15 percent rayon staple fiber can be blended with cotton without materially changing the appearance of the cotton yarn and fabric. Where "concealed blending" (i.e., the blending of cotton and rayon staple under the label of a pure cotton) is practiced, a lower rayon staple price can encourage the use of rayon staple by the manufacturers. However, if such yarn is sold as pure cotton at pure cotton yarn prices, the price advantage of rayon staple never reaches the fabric manufacturer



or the consumer of the finished textile. Under such conditions the consumption of rayon staple fiber is encouraged over cotton, but the effect of lower raw material prices in increasing total fiber consumption does not follow. In any event, the lower price of either of the blended fibers can contribute to increased consumption only if yarn and fabric prices reflect the lower average raw material costs.

To meet price competition from other textile fibers, cotton growers must first achieve price flexibility by permitting supply and demand to influence the determination of market prices. Even if greater flexibility is obtained in raw cotton pricing, many factors operate against rapid price adjustments in subsequent processing stages. This problem is particularly apparent in the textile industry, where a high degree of specialization exists. It is not nearly so serious in an integrated industry, where sluggishness in the price movement of semiprocessed goods is primarily an accounting problem concerned with the allocation of costs among the various departments of a particular firm.

A large part of the textile industry in England and other Western European countries is highly specialized. Specialization produces a significant time lag in the passing on of lower raw material costs from spinners to weavers to finishers and finally to converters. For example, comparisons of raw cotton and cotton yarn prices in the British market show that cotton yarn prices are "sticky"; they hold to past levels or actually increase for several months even after a significant decline occurs in the price of raw cotton (see table 10). For instance, while the price index of American-type cotton in England was declining from 145.8 (1949 = 100) in October 1955 to 130.5 in April 1956, the index of American-type yarn was rising from 130.3 to 134.3. Unduly heavy stocks in the British cotton industry at the start of this period would have been a partial explanation for the failure of yarn prices to follow declining cotton prices. Actually, however, the British industry as a whole had for many months before October 1955 kept stocks to a minimum level and operated on a hand-to-mouth basis, simply because it expected further decreases in raw material prices.

Throughout Western Europe, the textile industry is highly specialized and unrestrained by antitrust legislation. Under such conditions, yarn spinners within a country can and do agree on minimum selling prices, which result in stickiness in price movement. They maintain that without such agreement, if market demand weakens, individual spinners with large supplies would be apt to put their stocks on the market at clearance prices that would wipe out profit



TABLE 10.--United Kingdom: Relative price movements of American-type cotton, yarn produced from American-type cotton, rayon filament yarn and staple fiber, and spun rayon yarn, January 1955-August 1956

[ June 30, 1949 = 100 ]

Year and month	Cotton, American-type		Rayon	
	Raw	Yarn	Filament yarn and staple	Spun rayon yarn
1955:				
January .....	152.9	136.6	130.1	133.6
February .....	151.9	136.1	130.1	129.5
March .....	149.3	134.2	130.1	129.5
April .....	146.6	132.9	130.1	125.2
May .....	148.3	134.2	130.1	125.0
June .....	148.1	134.4	130.1	125.0
July .....	147.7	134.1	130.1	125.0
August .....	149.1	133.5	130.1	125.0
September .....	147.9	132.1	130.1	125.0
October .....	145.8	130.3	130.1	125.2
November .....	138.3	133.4	130.1	124.2
December .....	138.1	132.7	130.1	124.2
1956:				
January .....	130.8	133.4	130.1	122.4
February .....	131.0	134.9	130.1	122.4
March .....	132.0	134.1	130.1	127.2
April .....	130.5	134.3	130.1	127.2
May .....	134.2	134.4	130.1	127.2
June .....	135.3	134.4	130.1	127.2
July .....	134.3	133.2	130.1	127.2
August .....	125.3	125.6	130.1	127.2

"Board of Trade Index Numbers," as published periodically in the Textile Weekly, London, England.

margins for their segment of the industry without stimulating either the weaving industry or other further processing stages. This argument has some validity from the standpoint of practical business even if not from that of pure economics. However, spinner groups who justify minimum pricing agreements on these grounds are frequently strong advocates of unrestricted competition in raw material markets, where, of course, price flexibility works to their advantage only in a bearish market.

The speed at which lower raw cotton prices are passed along the stages of processing is very important to cotton producers who expect reduced prices to contribute to increased consumption. Rapid market adjustments are prevented by the serious time lag between a drop in raw cotton prices and a corresponding drop in the prices of cotton yarn and subsequently those of the finished cotton fabrics. In countries where there are pricing agreements among the various segments of industry, this problem is more serious than in those where a higher degree of competition exists among spinners.

The United States Government's price and export sales policy has made it practically impossible for foreign

spinners to hedge purchases of raw cotton on the New York futures market. Hedging serves as a protection to these spinners when the raw cotton market is highly competitive and yarn buyers are in a strong position. Inability to hedge, on the other hand, creates serious difficulties for the foreign spinners. It increases the financial risk of spinning, discourages the carrying of adequate raw cotton stocks, and in the final analysis, contributes to higher yarn prices that are more characteristic of a scarcity situation in cotton than of the surplus situation that exists at the present time. When prices are softening, the situation becomes progressively more serious. Without a futures market, spinners of yarn feel that the trend toward lower cotton prices in the short or the long run is a deterrent instead of an incentive to increased consumption. Stability of price is more important to them in maintaining a high volume of cotton consumption than the level of price, provided the price of cotton is reasonably in line with the price of competing fibers.

Cotton producers have given considerable thought to the importance of the relative prices of raw cotton and rayon staple fiber, particularly to the effect that a reduction in the price of raw cotton would have on the consumption of cotton. Many have felt that although the demand for raw cotton is relatively inelastic in the short run, price reductions would increase consumption in the long run at the expense of other fibers.

One important technique that increases the consumption of one fiber at the expense of another is the practice of blending fibers in the manufacture of yarn and in the mixture of yarns in the manufacture of fabrics. There is a widespread belief that when the spread between the prices of raw cotton and rayon staple fiber is wide, the fabric manufacturers can reduce overall fabric costs significantly by blending the two fibers. Calculations have been made in tables 11, 12, and 13 to show how variations in the prices of these two fibers do actually affect the total raw material costs of three selected blended fabrics.

In table 11, raw material costs per yard have been calculated for an 8-ounce fabric blend half cotton and half rayon, comparable in weight with single-filling duck or heavy twill. The price of rayon staple fiber (on a waste-free basis) is assumed to range downward from 36 cents to 23 cents per pound, and that of raw cotton (also on a waste-free basis) from 40 cents to 23 cents a pound. For example, the raw materials in such a blend would cost 17-1/2 cents a yard when the price of rayon is 30 cents a pound and the price of raw cotton 40 cents. If the price of raw cotton

were reduced from 40 cents to 30 cents a pound, and the price of rayon staple were to remain at 30 cents, the raw material cost for such a fabric would be 15 cents a yard, or 2-1/2 cents lower, provided no changes occurred in the cost of fabrication. Thus a 10-cent drop in the price of cotton would result in a very minor saving per yard.

Table 12 gives similar cost comparisons for an 8-ounce blended fabric two-thirds cotton and one-third rayon staple. Here, the same drop in the price of cotton, with the same constant price for rayon staple fiber, would result in lower raw material costs of only 3-1/3 cents a yard.

Table 13 makes comparisons for a 4-ounce blend of two-thirds cotton and one-third rayon staple fiber, comparable in weight with 80-square print cloth or broadcloth. Here, the effect of the 10-cent reduction in the price of raw cotton would be to reduce the raw material cost by only about 1-2/3 cents a yard.

The raw material cost of finished fabrics is a relatively small percentage of the retail price paid by consumers. In the following hypothetical cases, fabric costs per yard are compared on a percentage basis with the retail price of finished fabrics selling from 60 cents to \$1.40 per yard. The weight of the fabric in these examples is 4 ounces, comparable with that of an 80-square print cloth blended of two-thirds cotton and one-third rayon staple.

Retail price of fabric per yard	Raw material cost per yard		Retail price of fabric per yard	Raw material cost per yard	
	9.17 cents	7.50 cents		9.17 cents	7.50 cents
	Percent	Percent		Percent	Percent
\$0.60 .....	15.3	12.5	\$1.20 .....	7.6	6.3
\$0.80 .....	11.5	9.4	\$1.40 .....	6.6	5.4
\$1.00 .....	9.2	7.5			

The tabulation above shows that a reduction of 25 percent in the price of raw cotton would be relatively unimportant in reducing the cost of a cotton-rayon blended fabric, even if the full price reduction were passed on to the ultimate consumer.

These figures illustrate the difficulty of increasing cotton consumption by reducing the price of raw cotton. There are so many other costs involved in finishing, fabrication, and distribution that a large reduction in the price of raw cotton has only a small effect on the price of the finished product. In fact, the 25-percent reduction that has been used throughout this discussion would cut only 6-2/3 cents from the cost of a woman's dress requiring four yards of material comparable with that used in the illustration. The retail trade, which ordinarily sets prices at eye-catching figures, would not as a rule pass this nominal saving on to

TABLE 11.--Calculated raw material costs of a cotton-rayon fabric blend of one-half cotton and one-half rayon staple, weighing 8 ounces per yard<sup>1</sup>

Price of raw cotton (cents per pound, waste-free basis)	Price per pound of rayon staple fiber													
	36 cents	35 cents	34 cents	33 cents	32 cents	31 cents	30 cents	29 cents	28 cents	27 cents	26 cents	25 cents	24 cents	23 cents
40 .....	Cents per yd. 19.00	Cents per yd. 18.75	Cents per yd. 18.50	Cents per yd. 18.25	Cents per yd. 18.00	Cents per yd. 17.75	Cents per yd. 17.50	Cents per yd. 17.25	Cents per yd. 17.00	Cents per yd. 16.75	Cents per yd. 16.50	Cents per yd. 16.25	Cents per yd. 16.00	Cents per yd. 15.75
39 .....	18.75	18.50	18.25	18.00	17.75	17.50	17.25	17.00	16.75	16.50	16.25	16.00	15.75	15.50
38 .....	18.50	18.25	18.00	17.75	17.50	17.25	17.00	16.75	16.50	16.25	16.00	15.75	15.50	15.25
37 .....	18.25	18.00	17.75	17.50	17.25	17.00	16.75	16.50	16.25	16.00	15.75	15.50	15.25	15.00
36 .....	18.00	17.75	17.50	17.25	17.00	16.75	16.50	16.25	16.00	15.75	15.50	15.25	15.00	14.75
35 .....	17.75	17.50	17.25	17.00	16.75	16.50	16.25	16.00	15.75	15.50	15.25	15.00	14.75	14.50
34 .....	17.50	17.25	17.00	16.75	16.50	16.25	16.00	15.75	15.50	15.25	15.00	14.75	14.50	14.25
33 .....	17.25	17.00	16.75	16.50	16.25	16.00	15.75	15.50	15.25	15.00	14.75	14.50	14.25	14.00
32 .....	17.00	16.75	16.50	16.25	16.00	15.75	15.50	15.25	15.00	14.75	14.50	14.25	14.00	13.75
31 .....	16.75	16.50	16.25	16.00	15.75	15.50	15.25	15.00	14.75	14.50	14.25	14.00	13.75	13.50
30 .....	16.50	16.25	16.00	15.75	15.50	15.25	15.00	14.75	14.50	14.25	14.00	13.75	13.50	13.25
29 .....	16.25	16.00	15.75	15.50	15.25	15.00	14.75	14.50	14.25	14.00	13.75	13.50	13.25	13.00
28 .....	16.00	15.75	15.50	15.25	15.00	14.75	14.50	14.25	14.00	13.75	13.50	13.25	13.00	12.75
27 .....	15.75	15.50	15.25	15.00	14.75	14.50	14.25	14.00	13.75	13.50	13.25	13.00	12.75	12.50
26 .....	15.50	15.25	15.00	14.75	14.50	14.25	14.00	13.75	13.50	13.25	13.00	12.75	12.50	12.25
25 .....	15.25	15.00	14.75	14.50	14.25	14.00	13.75	13.50	13.25	13.00	12.75	12.50	12.25	12.00
24 .....	15.00	14.75	14.50	14.25	14.00	13.75	13.50	13.25	13.00	12.75	12.50	12.25	12.00	11.75
23 .....	14.75	14.50	14.25	14.00	13.75	13.50	13.25	13.00	12.75	12.50	12.25	12.00	11.75	11.50

<sup>1</sup>Weight comparable with that of a single-filling duck.

TABLE 12.--Calculated raw material costs of a cotton-rayon fabric blend of two-thirds cotton and one-third rayon staple, weighing 8 ounces per yard<sup>1</sup>

Price of raw cotton (cents per pound, waste-free basis)	Price per pound of rayon staple fiber													
	36 cents	35 cents	34 cents	33 cents	32 cents	31 cents	30 cents	29 cents	28 cents	27 cents	26 cents	25 cents	24 cents	23 cents
40 .....	Cents per yd. 19.33	Cents per yd. 19.16	Cents per yd. 19.00	Cents per yd. 18.83	Cents per yd. 18.66	Cents per yd. 18.50	Cents per yd. 18.33	Cents per yd. 18.16	Cents per yd. 18.00	Cents per yd. 17.83	Cents per yd. 17.66	Cents per yd. 17.50	Cents per yd. 17.33	Cents per yd. 17.16
39 .....	19.00	18.83	18.66	18.50	18.33	18.16	18.00	17.83	17.66	17.50	17.33	17.16	17.00	16.83
38 .....	18.67	18.50	18.33	18.16	18.00	17.83	17.66	17.50	17.33	17.16	17.00	16.83	16.66	16.50
37 .....	18.33	18.16	18.00	17.83	17.66	17.50	17.33	17.16	17.00	16.83	16.66	16.50	16.33	16.16
36 .....	18.00	17.83	17.66	17.50	17.33	17.16	17.00	16.83	16.66	16.50	16.33	16.16	16.00	15.83



35	17.66	17.50	17.33	17.16	17.00	16.83	16.66	16.50	16.33	16.16	16.00	15.83	15.66	15.50
34	17.33	17.16	17.00	16.83	16.66	16.50	16.33	16.16	16.00	15.83	15.66	15.50	15.33	15.16
33	17.00	16.83	16.66	16.50	16.33	16.16	16.00	15.83	15.66	15.50	15.33	15.16	15.00	14.83
32	16.67	16.50	16.33	16.16	16.00	15.83	15.66	15.50	15.33	15.16	15.00	14.83	14.66	14.50
31	16.33	16.16	16.00	15.83	15.66	15.50	15.33	15.16	15.00	14.83	14.66	14.50	14.33	14.16
30	16.00	15.83	15.66	15.50	15.33	15.16	15.00	14.83	14.66	14.50	14.33	14.16	14.00	13.83
29	15.66	15.50	15.33	15.16	15.00	14.83	14.66	14.50	14.33	14.16	14.00	13.83	13.66	13.50
28	15.33	15.16	15.00	14.83	14.66	14.50	14.33	14.16	14.00	13.83	13.66	13.50	13.33	13.16
27	15.00	14.83	14.66	14.50	14.33	14.16	14.00	13.83	13.66	13.50	13.33	13.16	13.00	12.83
26	14.67	14.50	14.33	14.16	14.00	13.83	13.66	13.50	13.33	13.16	13.00	12.83	12.66	12.50
25	14.33	14.16	14.00	13.83	13.66	13.50	13.33	13.16	13.00	12.83	12.66	12.50	12.33	12.16
24	14.00	13.83	13.67	13.50	13.33	13.16	13.00	12.83	12.66	12.50	12.33	12.16	12.00	11.83
23	13.67	13.50	13.33	13.16	13.00	12.83	12.66	12.50	12.33	12.16	12.00	11.83	11.66	11.50

<sup>1</sup>Weight comparable with that of a single-filling duck.

TABLE 13.--Calculated raw material costs of a cotton-rayon fabric blend of two-thirds cotton and one-third rayon staple, weighing 4 ounces per yard<sup>1</sup>

Price of raw cotton (cents per pound, waste-free basis)	Price per pound of rayon staple fiber													
	36 cents	35 cents	34 cents	33 cents	32 cents	31 cents	30 cents	29 cents	28 cents	27 cents	26 cents	25 cents	24 cents	23 cents
40	Cents per yd. 9.67	Cents per yd. 9.58	Cents per yd. 9.50	Cents per yd. 9.42	Cents per yd. 9.33	Cents per yd. 9.25	Cents per yd. 9.17	Cents per yd. 9.08	Cents per yd. 9.00	Cents per yd. 8.92	Cents per yd. 8.84	Cents per yd. 8.75	Cents per yd. 8.67	Cents per yd. 8.58
39	9.50	9.42	9.33	9.25	9.17	9.08	9.00	8.92	8.84	8.75	8.67	8.58	8.50	8.42
38	9.33	9.25	9.17	9.08	9.00	8.92	8.84	8.75	8.67	8.58	8.50	8.42	8.34	8.25
37	9.17	9.08	9.00	8.92	8.84	8.75	8.67	8.58	8.50	8.42	8.34	8.25	8.17	8.08
36	9.00	8.92	8.84	8.75	8.67	8.58	8.50	8.42	8.34	8.25	8.17	8.08	8.00	7.92
35	8.84	8.75	8.67	8.58	8.50	8.42	8.34	8.25	8.17	8.08	8.00	7.92	7.84	7.75
34	8.67	8.58	8.50	8.42	8.34	8.25	8.17	8.08	8.00	7.92	7.84	7.75	7.67	7.58
33	8.50	8.42	8.34	8.25	8.17	8.08	8.00	7.92	7.84	7.75	7.67	7.58	7.50	7.42
32	8.34	8.25	8.17	8.08	8.00	7.92	7.84	7.75	7.67	7.58	7.50	7.42	7.34	7.25
31	8.17	8.08	8.00	7.92	7.84	7.75	7.67	7.58	7.50	7.42	7.34	7.25	7.17	7.08
30	8.00	7.92	7.84	7.75	7.67	7.58	7.50	7.42	7.34	7.25	7.17	7.08	7.00	6.92
29	7.84	7.75	7.67	7.58	7.50	7.42	7.34	7.25	7.17	7.08	7.00	6.92	6.84	6.75
28	7.67	7.58	7.50	7.42	7.34	7.25	7.17	7.08	7.00	6.92	6.84	6.75	6.67	6.58
27	7.50	7.42	7.34	7.25	7.17	7.08	7.00	6.92	6.84	6.75	6.67	6.58	6.50	6.42
26	7.34	7.25	7.17	7.08	7.00	6.92	6.84	6.75	6.67	6.58	6.50	6.42	6.34	6.25
25	7.17	7.08	7.00	6.92	6.84	6.75	6.67	6.58	6.50	6.42	6.34	6.25	6.17	6.08
24	7.00	6.92	6.84	6.75	6.67	6.58	6.50	6.42	6.34	6.25	6.17	6.08	6.00	5.92
23	6.84	6.75	6.67	6.58	6.50	6.42	6.34	6.25	6.17	6.08	6.00	5.92	5.84	5.75

<sup>1</sup>Weight comparable with that of an 80-square print cloth.

the consumer. The price of a woman's dress, therefore, would remain at \$10.95, for example, whether or not the margin to the retailer were increased or reduced by 6-2/3 cents.

Nevertheless, when there is a wide differential between cotton and rayon prices, the consideration of price may well be an important factor determining the relative demand and use of one fiber as compared with another. However, after the prices of the competing raw materials are brought close together and kept in line, further reductions in raw materials prices would probably not be very significant in expanding total fiber consumption, certainly where raw material costs are such a small proportion of the price of the finished product.

### Overcoming Consumer Resistance

Although several compelling factors encourage fiber blending, consumers throughout Western Europe have shown strong resistance to fabrics of blended fibers. Nonetheless, slow but steady progress has been made in overcoming this resistance. Largely responsible for this trend is the vigorous development and promotional work carried on by the producers of rayon and other synthetic fibers in Western Europe. They are exploiting every conceivable advantage that rayon and other synthetic fibers may have--whether it be price, as in the case of rayon staple fiber, or whether it be particular quality characteristics that the various synthetics may impart to the finished end products. Development and promotional work on blends of rayon staple and cotton is a major activity in practically every country of Western Europe. Such work is not limited to rayon-cotton blends, however, for much attention and effort is being given to blending rayon and the other synthetics with the other natural fibers--wool, silk, and flax--and with one another.

The objectives of development work in fiber blending vary widely from country to country. In some countries the major activity is toward the development of new standard blended fabrics, which already represent a large share of the total textile market. In others, the major effort is directed toward the development of new high-fashion fabrics with special style appeal. In practically every country, however, some attention is devoted to the development of standard blends that have potential use in the bulk of the textile market. In this area high priority is given to blends of rayon staple with cotton and wool.

In England, a well-planned research and promotional program is under way for the development of fabrics utilizing

rayon and the other synthetic fibers. Both private and public research groups are concerned with this work and "suitability for purpose" is a major consideration in the development of blended fabrics. In determining "suitability for purpose," one important British manufacturer supplements laboratory tests by extensive wear trials under practical conditions. Thus it can evaluate such factors as resistance to soiling, color fastness, and shape.

The following are some of the important rayon-cotton blends that the British industry uses commercially and backs by energetic promotion:

1. Blends of two-thirds Peruvian Tanguis cotton and one-third rayon staple. This English blend, known as Perro, has been readily accepted by the public. It originated when Britain's wartime Cotton Board found it difficult to get enough Peruvian cotton for the hosiery trade. First used in the knitting industry, this blend is now being used on a growing scale for woven fabrics--shirtings, sheetings, drills, and denims. Similar blends are being made with United States cottons. Many technicians in the rayon industry point out that yarns produced from blends of rayon staple and cotton require use of a high-quality long-staple cotton; these blended yarns are technically superior to many pure cotton yarns spun from cottons of medium grade or lower.
2. Cotton-rayon blends for nurses' uniforms. Extensive wear trials have been made of fabrics involving the following blends: (a) 33-1/3 percent rayon staple, 66-2/3 percent cotton; (b) 50 percent rayon staple, 50 percent cotton; and (c) 66-2/3 percent rayon staple, 33-1/3 percent cotton. An active promotional effort is now being carried on to encourage the commercial use of the 50 percent rayon-cotton blended fabric in nurses' uniforms.
3. Cotton-rayon blends in utility drill fabrics. A blended fabric of two-thirds U.S. Strict Middling 1-inch cotton and one-third rayon staple fiber in white, navy blue, and khaki has been tested in wear trials conducted in cooperation with government departments such as the Post Office, the Prison Commission, government laboratories, and hospitals. After completion of the wear trials, many of these institutions switched to this blended fabric. Its use in utility clothing is being vigorously promoted by the rayon producers.

The commercial importance of the cotton-rayon blends in England was relatively minor until the last 3 or 4 years. The production of the Perro blend increased from 180,000

pounds a week in 1952 by nearly 300 percent in a little over 12 months.<sup>10</sup> Current production of this blend is reported to be about 700,000 pounds a week. Extensive research and development, and the completion of extensive wear trials over the last 6 or 8 years on blended denims, drills, sheetings, towels, and shirts, are the basis for promotional efforts to expand the use of rayon-cotton blends. To reverse the increasing commercial importance of these blends in England would be extremely difficult. However, the trend toward lower cotton prices may slow down the trend toward blending.

In West Germany, blended yarns of rayon staple fiber and cotton are reported being used on a large scale in the knitting industry. On the other hand, there is little evidence that such blends are used to any appreciable extent in woven fabrics. The principal reasons given for the extensive use of cotton-rayon blends in knitted fabrics are (1) that they have technological advantages in processing, (2) that they give satisfactory results in a wide range of knitted products, and (3) that price has tended to favor their use. Textile people say that even if rayon staple's price advantage over cotton were eliminated, the use of blended yarns would continue because of the technological advantages and the general acceptability of blends in knitted goods. Blends of rayon staple and wool have also developed broad consumer appeal in West Germany, especially for women's apparel such as skirts and dresses.

In France, Italy, the Netherlands, and Belgium there is considerable blending of pure yarns--cotton yarn, spun rayon, rayon filament, spun acetate filament, as well as other synthetic yarns. Discussions with textile people give the impression that this type of blending is more prevalent in these countries than in either England or West Germany. The usual reason given is that such blending can produce special fabric designs and finishing effects. In the blending of pure fiber yarns, raw material prices are considered of minor importance. In fact, many of the synthetic yarns are considerably more costly than the yarns spun from cotton or rayon staple.

These countries also blend cotton and rayon staple fibers at the yarn stage, and blended yarns are popular in their knitting industries, as in that of Western Germany.

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<sup>10</sup> Boyd, John, and Tattersfield, C. P. Blends of Viscose Staple With Cotton for Work Clothes. [ Paper presented at meeting of Am. Assoc. for Textile Technol., Inc., New York, 1954. ]



In France, it is reported, the specification "coton" allows a 15 percent maximum of rayon staple to be blended with cotton.<sup>11</sup> Some of the principal end uses of "coton" fabrics are work clothes, overalls, shirting, and calicos. The specification "coton pur" may be applied only to materials of 100 percent cotton. There is reason to believe that considerable fiber blending is practiced in France. However, the extent to which fiber blending at the yarn stage is practiced is much more difficult to assess for France and Italy than for countries such as England and West Germany, where more detailed statistics are available.

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<sup>11</sup>Boyd, John. Some Uses of Rayon and Synthetic Fibers by Government and Administrative Services in Europe.  
[Reprint of paper presented at meeting of International Congress of Synthetic and Artificial Textiles, Paris, 1954.]

## APPENDIX

### The Problem of Terminology

The study of textile fibers other than the natural is fraught with a most difficult problem resulting from the lack of a universally adopted system of terminology to describe the chemically produced fibers that are now available to the textile manufacturers. Since the reader may feel that "he who talks with me must define his terms," this section is included to point out the nature of the problem and to set forth the solution adopted herein.

As Dr. B. M. Sweers pointed out in a paper given at the first International Congress of Artificial and Synthetic Textiles in June 1954, complications in this field exist because of the variety of motives and interests possessed by the groups involved, the wide variety of solutions proposed, and the present dynamic stage of developments in the textile industry.<sup>12</sup>

When rayon was first discovered, it was thought of only as a poor man's substitute for silk and was therefore called "artificial silk." In an effort to remove the stigma of the term "artificial silk," which implied a substitute of inferior quality, the National Retail Dry Goods Association in 1924 appointed a committee to study this problem; and the name "rayon," which was recommended by this committee, was adopted by leading textile groups in the United States and Great Britain. The Journal of the Textile Institute, reporting this development in an article entitled "Textile Terms and Definitions," states:

Inasmuch as the known forms of "artificial silk" at that time included filaments spun from cellulose, proteins and organic chemicals that could be synthesised in the laboratory, it may be assumed that the name "rayon" was adopted to cover all types of non-natural textile filaments.<sup>13</sup>

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<sup>12</sup>Sweers, B. M. Problems of Textile Labelling. [Paper presented at meeting of International Congress of Synthetic and Artificial Textiles, Paris, 1954.]

<sup>13</sup>Textile Inst. Jour. [Manchester, England] 38:615-628. 1947.

As the chemists progressed in the textile field, more products, more terminology, and more confusion were added to the problem of a universal system of definitions, major groupings, and an all-inclusive designation. In his address to the International Congress, Dr. Sweers, who is probably the world's foremost authority on textile labeling and terminology, pointed out that presently there is no one convenient generic term covering all non-natural fibers.<sup>14</sup>

In Western European textile circles, non-natural fibers of cellulosic origin are usually referred to as artificial fibers, and those of non-cellulosic origin are called synthetic fibers.

In the United States, cellulosic fibers are classified as either rayon or acetate, while other chemical fibers, except glass fibers and the regenerated protein fibers, are referred to as the noncellulosics. Many groups in the United States are inclined to use the term "synthetic fibers" to cover all non-natural fibers. Others in the United States have tried to gain acceptance of the term "man-made fibers" for the same purpose, as have also some groups in England. Those who use the term "man-made," however, fail to recognize that the production of cotton, silk, and the other natural fibers requires many times more manpower than the production of the non-natural fibers. Thus, it is a misnomer as well as an ambiguous and meaningless term.

In Canada, the term "manufactured fibers" is probably the most meaningful of all as a name for the whole group of non-natural fibers, yet it has not received acceptance in textile circles. In Germany, the term "chemiefaser," meaning chemical fibers, is used. Though quite comprehensive and logical, it has not been generally accepted in other countries.

There is no less confusion in the main groupings of these textile fibers. For the purpose of assessing customs duties, many countries use two groupings for all fibers that do not exist in the natural state: "synthetic" for those produced by chemical synthesis, and "artificial" for those obtained from the transformation of cellulose and other animal or vegetable matter. Adoption of the terms "rayon" and "synthetic" to designate main groupings, however, leaves no place for alginates and the various protein fibers. Moncrieff, in his book "Artificial Fibres," states:

While there are no hard and fast rules, the reader is advised to use the word "rayon" for fibres of cellulosic origin (viscose, cuprammonium, and cellulose acetate) and the term "synthetic

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<sup>14</sup>Sweers, B. M., op. cit.

fibres" for the true synthetics, nylon, Vinyon, etc. . . . The regenerated proteins—Ardil, Lanital, etc.—and glass fibres are probably most simply referred to as artificial fibres.<sup>15</sup>

To simplify discussion in this report, the term "rayon and all other synthetic fibers" has been used to designate all fibers other than the natural, i.e., the fiber products of the chemical laboratory as contrasted to the fiber products of agriculture.

The term rayon in this report refers to the cellulosic fibers and in the broader sense includes acetate. The broader meaning is the same as it was in the United States prior to the distinction that was recommended in terminology several years ago, when the industry agreed to refer specifically to either rayon (meaning rayon of the viscose or cuprammonium process) or acetate (meaning rayon of the acetate process). Compared with acetate, viscose rayon is more directly competitive with cotton pricewise in a broad range of end uses. In recent years the quoted prices of acetate staple have come directly in line with those of viscose rayon staple. Despite this, however, acetate still competes with cotton in a relatively narrow range of end uses.

The term "all other synthetic fibers" in this report is used loosely to refer to all fibers in the noncellulosic group, unless there is reason to describe specific fibers such as nylon, Orlon, Dacron, or any one of the many fibers of protein or other origin.

In order to identify more accurately some of the specific fibers mentioned in this report, such terms are used as rayon staple, rayon filament, acetate staple, acetate filament, regular tenacity rayon filament, high tenacity rayon filament, etc. This should not cause serious difficulty to the reader, for these terms are common in textile circles.

The major groupings generally used for synthetic fibers in the United States, as well as the common terminology for such fibers, are based upon the Textile World's "Synthetic Fiber Table," 1955 revision.<sup>16</sup>

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<sup>15</sup>Moncrieff, R. W. Artificial Fibres. Ed. 2, 455 pp. New York. 1954.

<sup>16</sup>Textile World, September 1955.